

Results for Scheduling Benchmark Classes

Luis Quesada and Helmut Simonis

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Abstract

this reposts lists results of the *tbischeduling* tool for a number of existing benchmarks on scheduling related problems. The results indicate that depending on the problem type, only a fraction of the benchmarks are solved to optimality, while good or reasonable results are obtained by CPOptimizer of IBM.

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Chapter 1

Introduction

The results are obtained by running the TestAll main routine for the different benchmark problems, selecting the necessary parameters and limits for each benchmark type.

The detailed execution time depends on many parameters that are not well controlled in the test environment, so the results should be considered with caution. Tests were run on a Windows 11 laptop using CPOptimizer 22.1.0, and CPSat 9.11, both using their Java API.

Chapter 2

Overview

The following tables compare the results of CPOptimizer and CPSat on a number of well-known benchmark problems. Note that the programs used are the generic solutions of the problems, there was no attempt to improve lower bounds, or add redundant constraints that would improve pruning for a specific problem class. As such, the results indicate "out-of-the-box" performance of the solvers.

The comparison does not attempt to compare the solutions found to the best known results, it is only intended to compare the results of the solvers considered based on the same underlying data model, running on the same hardware, with the same time limit.

Table 2.1 shows the results for the Taillard open shop problem set. All problems are solved to optimality by both solvers, given 600 seconds timeout and 4 resp. 8 threads for the solver. The results are grouped by instances classes where x/y indicate x jobs on y machines. We compare the time taken to find and prove the optimal solution based on the virtual best solution of the faster time of the solvers. For smaller instances, CPSat seems to be faster, but for larger instances CPOptimizer finds the solution more rapidly. Given that all results are obtained in atmost a few seconds on either solver, this does not seem to be a significant difference.

Table 2.1: Comparison of CPO and CPSat for Result Groups of Taillard Open-Shop Problems

Group	Nr	All Instances				Optimal Only		Non Optimal Only		Bound (% of VB)	
		Optimal (% of All Instances)	Both		None	Time (% of VB)		Cost (% of VB)		CPO	
			CPO	CPSat		CPO	CPSat	CPO	CPSat	CPO	CPSat
4/4	10	100.00	0.00	0.00	0.00	639.09	100.00	n/a	n/a	n/a	n/a
5/5	10	100.00	0.00	0.00	0.00	217.83	100.00	n/a	n/a	n/a	n/a
7/7	10	100.00	0.00	0.00	0.00	206.25	106.99	n/a	n/a	n/a	n/a
10/10	10	100.00	0.00	0.00	0.00	119.36	150.15	n/a	n/a	n/a	n/a
15/15	10	100.00	0.00	0.00	0.00	100.00	288.65	n/a	n/a	n/a	n/a
20/20	10	100.00	0.00	0.00	0.00	114.30	207.41	n/a	n/a	n/a	n/a

Table 2.2 compares the results for the Taillard job shop problems. Only some of the problem groups are solved to optimality. For the 10/20 set, CPOptimizer proves optimality, while CPSat finds solutions which are very close to the optimal results. The bound results for 100/20 with CPSat are incorrect, and need to be recomputed.

Table 2.2: Comparison of CPO and CPSat for Result Groups of Taillard Job-Shop Problems

Group	Nr	All Instances Optimal (% of All Instances)				Optimal Only Time (% of VB)		Non Optimal Only Cost (% of VB)		Non Optimal Only Bound (% of VB)	
		Both	CPO	CPSat	None	CPO	CPSat	CPO	CPSat	CPO	CPSat
15/15	10	90.00	0.00	0.00	10.00	105.19	141.18	100.00	100.00	97.17	100.00
20/15	10	20.00	0.00	0.00	80.00	267.27	263.20	100.99	100.05	98.50	99.93
20/20	10	0.00	0.00	0.00	100.00	n/a	n/a	100.74	100.06	97.96	100.00
30/15	10	10.00	0.00	10.00	80.00	174.32	100.00	100.18	100.49	99.87	100.00
30/20	10	0.00	0.00	0.00	100.00	n/a	n/a	100.30	101.30	99.40	100.00
50/15	10	100.00	0.00	0.00	0.00	100.00	685.09	n/a	n/a	n/a	n/a
50/20	10	10.00	60.00	0.00	30.00	100.00	381.38	100.00	101.60	100.00	100.00
100/20	10	10.00	90.00	0.00	0.00	100.00	416.13	100.00	101.73	100.00	66.81

Table 2.3: Comparison of CPO and CPSat for Result Groups of Taillard Flow-Shop Problems

Group	Nr	All Instances Optimal (% of All Instances)				Optimal Only Time (% of VB)		Non Optimal Only Cost (% of VB)		Non Optimal Only Bound (% of VB)	
		Both	CPO	CPSat	None	CPO	CPSat	CPO	CPSat	CPO	CPSat
20/5	10	100.00	0.00	0.00	0.00	203.99	101.36	n/a	n/a	n/a	n/a
20/10	10	10.00	0.00	10.00	80.00	415.20	100.00	100.54	100.19	100.00	98.52
20/20	10	0.00	0.00	0.00	100.00	n/a	n/a	102.07	100.19	100.00	96.83
50/5	10	100.00	0.00	0.00	0.00	317.33	101.91	n/a	n/a	n/a	n/a
50/10	10	0.00	0.00	0.00	100.00	n/a	n/a	103.31	100.00	100.00	99.49
50/20	10	0.00	0.00	0.00	100.00	n/a	n/a	105.18	100.00	100.00	99.27
100/5	10	0.00	0.00	70.00	30.00	n/a	n/a	100.49	100.00	99.98	99.98
100/10	10	0.00	0.00	0.00	100.00	n/a	n/a	107.11	100.00	100.00	99.91
100/20	10	0.00	0.00	0.00	100.00	n/a	n/a	107.94	100.00	100.00	99.76
200/10	10	0.00	0.00	0.00	100.00	n/a	n/a	108.32	100.00	100.00	99.97
200/20	10	0.00	0.00	0.00	100.00	n/a	n/a	105.86	100.00	99.98	99.98
500/20	10	0.00	0.00	0.00	100.00	n/a	n/a	106.46	100.00	52.45	100.00

Table 2.3 shows the results for the Taillard flow shop problems. Instance sets 20/5 and 50/5 are solved to optimality by both solvers, CPOptimizer finds many optimal solutions for the 100/5 sets. There are a few optimal solutions for the 20/10 set as well. Execution times for the optimal solutions seems to be significantly higher for CPSat. Comparing the non-optimal solutions, CPOptimizer consistently finds better solutions, but on average, CPSat is within 10% of the CPOptimizer result. For the bounds, CPSat often provide slightly better lower bounds, but CPOptimizer results are pretty close. Note that for the bounds, a higher value is better, so achieving 100% of the virtual best bound is better than achieving 98%.

Table 2.4 compares the results for CPOptimizer for the regular flow shop and the permutation flow shop version on the same data. The model for the permutation flow shop is not available with CPSat. A number of instances are solved to optimality with the permutation flow shop variant, but these optimal solutions typically are not optimal for the unrestricted version. In general, it is much faster to find the optimal solution for the permutation flowshop version, and perhaps surprisingly, the results for the non-optimal instances are often superior for the permutation flowshop. The bounds for the permutation flowshop are stronger, but they are not valid bounds for the unrestricted version.

Table 2.4: Comparison of CPO for Result Groups of Permutation and Unrestricted FlowShop Problems

Group	Nr	All Instances Optimal (% of All Instances)				Optimal Only Time (% of VB)		Non Optimal Only Cost (% of VB) Bound (% of VB)			
		Both	FSS	PFSS	None	FSS	PFSS	FSS	PFSS	FSS	PFSS
20/5	10	100.00	0.00	0.00	0.00	188.74	100.00	n/a	n/a	n/a	n/a
20/10	10	20.00	0.00	50.00	30.00	212.55	100.00	100.13	101.25	96.28	99.90
20/20	10	0.00	0.00	0.00	100.00	n/a	n/a	100.00	101.33	98.44	99.87
50/5	10	100.00	0.00	0.00	0.00	494.74	107.07	n/a	n/a	n/a	n/a
50/10	10	0.00	0.00	10.00	90.00	n/a	n/a	100.97	100.02	99.44	100.00
50/20	10	0.00	0.00	0.00	100.00	n/a	n/a	102.96	100.00	99.27	100.00
100/5	10	70.00	0.00	30.00	0.00	910.13	100.00	100.22	100.00	99.83	100.00
100/10	10	0.00	0.00	0.00	100.00	n/a	n/a	101.47	100.00	99.75	100.00
100/20	10	0.00	0.00	0.00	100.00	n/a	n/a	104.64	100.00	99.53	100.00
200/10	10	0.00	0.00	0.00	100.00	n/a	n/a	102.82	100.00	99.89	100.00
200/20	10	0.00	0.00	0.00	100.00	n/a	n/a	105.11	100.00	99.62	100.00
500/20	10	0.00	0.00	0.00	100.00	n/a	n/a	100.03	100.70	99.88	100.00

Table 2.5: Comparison of CPO and CPSat for Result Groups of SALBP-1 Problems

Group	Nr	All Instances Optimal (% of All Instances)				Optimal Only Time (% of VB)		Non Optimal Only Cost (% of VB) Bound (% of VB)			
		Both	CPO	CPSat	None	CPO	CPSat	CPO	CPSat	CPO	CPSat
20	525	99.62	0.00	0.38	0.00	1363.95	118.02	100.00	100.00	82.14	100.00
50	525	72.38	0.38	21.71	5.52	330.66	2609.56	100.22	100.05	92.69	100.00
100	525	57.14	0.57	11.43	30.86	177.94	499.89	101.17	100.04	94.77	100.00
1000	525	0.00	0.00	0.00	100.00	n/a	n/a	100.05	101.07	100.00	73.86

The results for SALBP-1 in Table 2.5 were obtained with a 30 second time-out. All of the 20 task instances were solved to optimality (some only with CPSat), while 88% of the 50 task instances were solved to optimality, but only 43% were solved by both. The time taken to find the common optimal solutions varies significantly, CPSat seems on average faster on the small instances,

while CPOptimizer is faster on a larger instances, but this does not hold for all instances. For the non-optimal solutions, solution quality seems very evenly balanced.

The results for the test scheduling case study are shown in Table 2.6. Very likely the 30 second timeout is too small for the large problem instances. Optimal solutions are found by both solvers for the smaller instance sizes, CPO does find some optimal solutions even for large problem sizes. Solution quality for up to 100 tasks is very close, while results for CPSat on the 500 task problems is disappointing compared to the CPO results. Already for 100 tasks, the time needed to find the optimal solutions is much higher for CPSat, the results may improve if more time is given for both solvers.

Table 2.6: Comparison of CPO and CPSat for Result Groups of Test Scheduling Problems

Group	Nr	All Instances Optimal (% of All Instances)				Optimal Only Time (% of VB)		Cost (% of VB) CPO	Non Optimal Only Bound (% of VB)		
		Both	CPO	CPSat	None	CPO	CPSat		CPO	CPSat	CPSat
20/10/3	20	90.00	0.00	5.00	5.00	393.93	133.28	100.00	100.00	92.00	100.00
20/10/5	20	100.00	0.00	0.00	0.00	294.88	117.68	n/a	n/a	n/a	n/a
20/10/10	20	95.00	0.00	0.00	5.00	501.45	107.85	100.00	100.00	100.00	100.00
30/10/3	20	95.00	0.00	0.00	5.00	100.48	183.16	100.08	100.00	100.00	100.00
30/10/5	20	90.00	0.00	5.00	5.00	100.00	205.76	100.00	100.00	89.37	100.00
30/10/10	20	70.00	0.00	15.00	15.00	382.57	104.61	100.01	100.00	93.29	100.00
30/20/3	20	95.00	0.00	5.00	0.00	205.53	144.45	100.00	100.00	97.45	100.00
30/20/5	20	90.00	0.00	10.00	0.00	229.19	132.32	100.00	100.00	88.36	100.00
30/20/10	20	60.00	0.00	30.00	10.00	439.18	104.94	100.00	100.00	89.44	100.00
40/10/3	20	85.00	0.00	0.00	15.00	104.79	280.75	100.02	100.02	100.00	100.00
40/10/5	20	90.00	0.00	5.00	5.00	194.05	150.11	100.00	100.00	98.22	100.00
40/10/10	20	70.00	0.00	20.00	10.00	231.87	109.84	100.00	100.00	93.80	100.00
40/20/3	20	100.00	0.00	0.00	0.00	100.19	172.54	n/a	n/a	n/a	n/a
40/20/5	20	75.00	0.00	20.00	5.00	154.81	109.98	100.00	100.00	95.30	100.00
40/20/10	20	50.00	0.00	35.00	15.00	285.15	106.26	100.00	100.00	92.51	100.00
50/10/3	20	85.00	0.00	0.00	15.00	466.49	100.00	100.00	100.00	100.00	100.00
50/10/5	20	45.00	0.00	10.00	45.00	682.15	100.00	100.00	100.00	99.31	100.00
50/10/10	20	15.00	0.00	30.00	55.00	1381.55	100.00	100.00	100.00	98.26	100.00
50/20/3	20	90.00	0.00	10.00	0.00	726.25	100.00	100.00	100.00	94.42	100.00
50/20/5	20	60.00	0.00	0.00	40.00	573.69	100.00	100.00	100.00	100.00	100.00
50/20/10	20	35.00	0.00	10.00	55.00	671.58	100.00	100.00	100.00	94.08	100.00
100/10/3	20	90.00	0.00	0.00	10.00	100.00	1998.93	100.00	100.00	100.00	100.00
100/10/5	20	45.00	5.00	0.00	50.00	100.00	1105.69	100.00	100.14	100.00	100.00
100/10/10	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	100.23	100.00	100.00
100/20/3	20	85.00	0.00	0.00	15.00	100.00	1552.40	100.00	100.12	100.00	100.00
100/20/5	20	35.00	15.00	0.00	50.00	100.00	2147.25	100.00	100.75	100.00	100.00
100/20/10	20	5.00	0.00	0.00	95.00	100.00	903.53	100.00	100.83	100.00	100.00
100/50/3	20	80.00	10.00	0.00	10.00	100.00	1410.06	100.00	100.78	100.00	100.00
100/50/5	20	45.00	10.00	0.00	45.00	100.00	805.32	100.00	100.11	100.00	100.00
100/50/10	20	10.00	5.00	0.00	85.00	100.00	1260.03	100.00	100.63	100.00	100.00
500/10/3	20	0.00	5.00	0.00	95.00	n/a	n/a	100.00	227.86	16.72	100.00
500/10/5	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	226.47	2.06	100.00
500/10/10	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	226.89	27.57	100.00
500/20/3	20	0.00	20.00	0.00	80.00	n/a	n/a	100.00	224.93	22.74	100.00
500/20/5	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	230.90	2.03	100.00
500/20/10	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	235.16	2.25	100.00
500/50/3	20	0.00	5.00	0.00	95.00	n/a	n/a	100.00	234.08	7.58	100.00
500/50/5	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	240.48	2.09	100.00
500/50/10	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	241.28	2.31	100.00
500/100/3	20	0.00	10.00	0.00	90.00	n/a	n/a	100.00	247.90	12.28	100.00
500/100/5	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	251.03	2.11	100.00
500/100/10	20	0.00	0.00	0.00	100.00	n/a	n/a	100.00	239.37	2.24	100.00

Table 2.7 compares CPO and CPSat for the Hybrid flexible flow shop problem of the factory design case study. For the smaller problem sizes, up to 40 jobs, both system offer comparable solution quality, with significantly high run

times for CPSat. Starting from the 50 job problem instances, but especially for the large 300 and 400 job problems, the solution quality of CPO is much better. Optimal solutions are found by both system up to size 30, CPSat finds more optimal solutions for the smaller problems, and CPO finds more optimal solution for larger instances (up to size 50).

While the results for CPO are clearly superior to the ones for CPSat for the 500 task problem instances, the given lower bound is very poor for CPO.

Table 2.7: Comparison of CPO and CPSat for Result Groups of Factory Design Problems

Group	Nr	All Instances Optimal (% of All Instances)				Optimal Only Time (% of VB)		Non Optimal Only Cost (% of VB)		Non Optimal Only Bound (% of VB)	
		Both	CPO	CPSat	None	CPO	CPSat	CPO	CPSat	CPO	CPSat
20	25	76.00	0.00	20.00	4.00	100.00	580.71	100.00	100.00	96.52	100.00
25	25	80.00	0.00	8.00	12.00	101.65	238.02	100.00	100.37	97.67	100.00
30	25	60.00	0.00	4.00	36.00	100.35	264.69	100.18	101.05	100.00	100.00
40	25	4.00	16.00	0.00	80.00	100.00	2554.03	100.00	104.68	100.00	100.00
50	25	0.00	4.00	0.00	96.00	n/a	n/a	100.00	107.87	100.00	100.00
100	25	0.00	0.00	0.00	100.00	n/a	n/a	100.00	120.43	100.00	100.00
200	25	0.00	0.00	0.00	100.00	n/a	n/a	100.00	188.60	100.00	100.00
300	24	0.00	0.00	0.00	100.00	n/a	n/a	100.00	263.22	100.00	100.00
400	25	0.00	0.00	0.00	100.00	n/a	n/a	100.00	246.34	100.00	100.00

Note that there is a single 300 job instance 300_2 for which CPSat did not find any solution within the timeout, so only 24 instances are compared.

The results for the single mode RCPSP problems do not use consistent settings, the smaller (j30 and j60) instances are run with a 600 seconds timeout, the j90 instances with a 30 seconds, and the j120 instances with a 60 second timeout. These larger instances should be rerun with a 600 seconds timeout, but that will require several days of CPU time.

Table 2.8: Comparison of CPO and CPSat for Results of RCPSP

Group	Nr	All Instances Optimal (% of All Instances)				Optimal Only Time (% of VB)		Non Optimal Only Cost (% of VB)		Non Optimal Only Bound (% of VB)	
		Both	CPO	CPSat	None	CPO	CPSat	CPO	CPSat	CPO	CPSat
30	480	100.00	0.00	0.00	0.00	200.13	166.70	n/a	n/a	n/a	n/a
60	480	89.58	0.00	1.04	9.38	109.84	358.74	100.20	100.45	98.89	98.66
90	480	80.21	0.00	0.63	19.17	108.11	332.72	100.34	101.13	99.76	99.19
120	600	44.83	0.33	0.50	54.33	111.75	444.15	100.20	101.30	99.78	98.45

Overall, the results are similar to other problem sets. For all instance sets, both CPO and SPSat find and prove optimal solutions, 100% for J30 instances, 90% for j60 instances, 80% for j90 instances, but only 45% for j120 instances. While the times for the j30 instances are comparable, the overall time for the larger instances is significantly higher for CPSat. Detailed results shows that many instances are solved by both solvers in less than a second, the differences arise from relatively few instances that take much longer in CPSat, while there are only few instances where CPO takes longer than CPSat.

For all non-optimal solutions, the solution quality obtained by both solvers within the timeout is nearly identical, with a very slight advantage for CPO for both solutions found and lower bound calculated.

Chapter 3

Taillard Open Shop Problems

All problems are solved to optimality, possibly due to their small to moderate size.

3.1 Results for CPOptimizer

Table 3.1: Results for Taillard OpenShop (CPO) (60 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai10 10 0.json	10	10	Optimal	0.45	637	637.00	0.00
tai10 10 1.json	10	10	Optimal	0.06	588	588.00	0.00
tai10 10 2.json	10	10	Optimal	0.27	598	598.00	0.00
tai10 10 3.json	10	10	Optimal	0.05	577	577.00	0.00
tai10 10 4.json	10	10	Optimal	0.05	640	640.00	0.00
tai10 10 5.json	10	10	Optimal	0.04	538	538.00	0.00
tai10 10 6.json	10	10	Optimal	0.06	616	616.00	0.00
tai10 10 7.json	10	10	Optimal	0.11	595	595.00	0.00
tai10 10 8.json	10	10	Optimal	0.05	595	595.00	0.00
tai10 10 9.json	10	10	Optimal	0.08	596	596.00	0.00
tai15 15 0.json	15	15	Optimal	0.11	937	937.00	0.00
tai15 15 1.json	15	15	Optimal	0.11	918	918.00	0.00
tai15 15 2.json	15	15	Optimal	0.08	871	871.00	0.00
tai15 15 3.json	15	15	Optimal	0.13	934	934.00	0.00
tai15 15 4.json	15	15	Optimal	0.09	946	946.00	0.00
tai15 15 5.json	15	15	Optimal	0.08	933	933.00	0.00
tai15 15 6.json	15	15	Optimal	0.16	891	891.00	0.00
tai15 15 7.json	15	15	Optimal	0.13	893	893.00	0.00
tai15 15 8.json	15	15	Optimal	0.28	899	899.00	0.00
tai15 15 9.json	15	15	Optimal	0.17	902	902.00	0.00
tai20 20 0.json	20	20	Optimal	0.35	1155	1155.00	0.00

Table 3.1: Results for Taillard OpenShop (CPO) (60 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai20 20 1.json	20	20	Optimal	1.00	1241	1241.00	0.00
tai20 20 2.json	20	20	Optimal	0.56	1257	1257.00	0.00
tai20 20 3.json	20	20	Optimal	0.25	1248	1248.00	0.00
tai20 20 4.json	20	20	Optimal	0.19	1256	1256.00	0.00
tai20 20 5.json	20	20	Optimal	0.16	1204	1204.00	0.00
tai20 20 6.json	20	20	Optimal	0.66	1294	1294.00	0.00
tai20 20 7.json	20	20	Optimal	1.18	1169	1169.00	0.00
tai20 20 8.json	20	20	Optimal	0.17	1289	1289.00	0.00
tai20 20 9.json	20	20	Optimal	0.17	1241	1241.00	0.00
tai4 4 0.json	4	4	Optimal	0.13	193	193.00	0.00
tai4 4 1.json	4	4	Optimal	0.11	236	236.00	0.00
tai4 4 2.json	4	4	Optimal	0.08	271	271.00	0.00
tai4 4 3.json	4	4	Optimal	0.15	250	250.00	0.00
tai4 4 4.json	4	4	Optimal	0.17	295	295.00	0.00
tai4 4 5.json	4	4	Optimal	0.05	189	189.00	0.00
tai4 4 6.json	4	4	Optimal	0.10	201	201.00	0.00
tai4 4 7.json	4	4	Optimal	0.05	217	217.00	0.00
tai4 4 8.json	4	4	Optimal	0.13	261	261.00	0.00
tai4 4 9.json	4	4	Optimal	0.12	217	217.00	0.00
tai5 5 0.json	5	5	Optimal	0.18	300	300.00	0.00
tai5 5 1.json	5	5	Optimal	0.16	262	262.00	0.00
tai5 5 2.json	5	5	Optimal	0.20	323	323.00	0.00
tai5 5 3.json	5	5	Optimal	0.17	310	310.00	0.00
tai5 5 4.json	5	5	Optimal	0.27	326	326.00	0.00
tai5 5 5.json	5	5	Optimal	0.16	312	312.00	0.00
tai5 5 6.json	5	5	Optimal	0.21	303	303.00	0.00
tai5 5 7.json	5	5	Optimal	0.25	300	300.00	0.00
tai5 5 8.json	5	5	Optimal	0.17	353	353.00	0.00
tai5 5 9.json	5	5	Optimal	0.25	326	326.00	0.00
tai7 7 0.json	7	7	Optimal	0.03	435	435.00	0.00
tai7 7 1.json	7	7	Optimal	0.12	443	443.00	0.00
tai7 7 2.json	7	7	Optimal	0.31	468	468.00	0.00
tai7 7 3.json	7	7	Optimal	0.03	463	463.00	0.00
tai7 7 4.json	7	7	Optimal	0.03	416	416.00	0.00
tai7 7 5.json	7	7	Optimal	0.80	451	451.00	0.00
tai7 7 6.json	7	7	Optimal	1.10	422	422.00	0.00
tai7 7 7.json	7	7	Optimal	0.05	424	424.00	0.00
tai7 7 8.json	7	7	Optimal	0.09	458	458.00	0.00
tai7 7 9.json	7	7	Optimal	0.06	398	398.00	0.00

3.2 Results for CPSat

Table 3.2: Results for Taillard OpenShop (CPSat) (60 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai10 10 0.json	10	10	Optimal	0.37	637	0.00	0.00
tai10 10 1.json	10	10	Optimal	0.07	588	0.00	0.00
tai10 10 2.json	10	10	Optimal	0.16	598	0.00	0.00
tai10 10 3.json	10	10	Optimal	0.09	577	0.00	0.00
tai10 10 4.json	10	10	Optimal	0.20	640	0.00	0.00
tai10 10 5.json	10	10	Optimal	0.13	538	0.00	0.00
tai10 10 6.json	10	10	Optimal	0.10	616	0.00	0.00
tai10 10 7.json	10	10	Optimal	0.17	595	0.00	0.00
tai10 10 8.json	10	10	Optimal	0.11	595	0.00	0.00
tai10 10 9.json	10	10	Optimal	0.14	596	0.00	0.00
tai15 15 0.json	15	15	Optimal	0.31	937	0.00	0.00
tai15 15 1.json	15	15	Optimal	0.45	918	0.00	0.00
tai15 15 2.json	15	15	Optimal	0.17	871	0.00	0.00
tai15 15 3.json	15	15	Optimal	0.17	934	0.00	0.00
tai15 15 4.json	15	15	Optimal	0.27	946	0.00	0.00
tai15 15 5.json	15	15	Optimal	0.25	933	0.00	0.00
tai15 15 6.json	15	15	Optimal	0.25	891	0.00	0.00
tai15 15 7.json	15	15	Optimal	0.32	893	0.00	0.00
tai15 15 8.json	15	15	Optimal	1.27	899	0.00	0.00
tai15 15 9.json	15	15	Optimal	0.38	902	0.00	0.00
tai20 20 0.json	20	20	Optimal	1.01	1155	0.00	0.00
tai20 20 1.json	20	20	Optimal	2.44	1241	0.00	0.00
tai20 20 2.json	20	20	Optimal	0.12	1257	0.00	0.00
tai20 20 3.json	20	20	Optimal	0.35	1248	0.00	0.00
tai20 20 4.json	20	20	Optimal	0.40	1256	0.00	0.00
tai20 20 5.json	20	20	Optimal	0.62	1204	0.00	0.00
tai20 20 6.json	20	20	Optimal	0.52	1294	0.00	0.00
tai20 20 7.json	20	20	Optimal	2.13	1169	0.00	0.00
tai20 20 8.json	20	20	Optimal	0.26	1289	0.00	0.00
tai20 20 9.json	20	20	Optimal	0.65	1241	0.00	0.00
tai4 4 0.json	4	4	Optimal	0.02	193	0.00	0.00
tai4 4 1.json	4	4	Optimal	0.03	236	0.00	0.00
tai4 4 2.json	4	4	Optimal	0.01	271	0.00	0.00
tai4 4 3.json	4	4	Optimal	0.01	250	0.00	0.00
tai4 4 4.json	4	4	Optimal	0.03	295	0.00	0.00
tai4 4 5.json	4	4	Optimal	0.01	189	0.00	0.00
tai4 4 6.json	4	4	Optimal	0.01	201	0.00	0.00
tai4 4 7.json	4	4	Optimal	0.01	217	0.00	0.00
tai4 4 8.json	4	4	Optimal	0.01	261	0.00	0.00
tai4 4 9.json	4	4	Optimal	0.01	217	0.00	0.00
tai5 5 0.json	5	5	Optimal	0.06	300	0.00	0.00
tai5 5 1.json	5	5	Optimal	0.04	262	0.00	0.00
tai5 5 2.json	5	5	Optimal	0.12	323	0.00	0.00
tai5 5 3.json	5	5	Optimal	0.07	310	0.00	0.00
tai5 5 4.json	5	5	Optimal	0.16	326	0.00	0.00

Table 3.2: Results for Taillard OpenShop (CPSat) (60 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai5 5 5.json	5	5	Optimal	0.07	312	0.00	0.00
tai5 5 6.json	5	5	Optimal	0.09	303	0.00	0.00
tai5 5 7.json	5	5	Optimal	0.11	300	0.00	0.00
tai5 5 8.json	5	5	Optimal	0.11	353	0.00	0.00
tai5 5 9.json	5	5	Optimal	0.11	326	0.00	0.00
tai7 7 0.json	7	7	Optimal	0.06	435	0.00	0.00
tai7 7 1.json	7	7	Optimal	0.11	443	0.00	0.00
tai7 7 2.json	7	7	Optimal	0.15	468	0.00	0.00
tai7 7 3.json	7	7	Optimal	0.06	463	0.00	0.00
tai7 7 4.json	7	7	Optimal	0.05	416	0.00	0.00
tai7 7 5.json	7	7	Optimal	0.48	451	0.00	0.00
tai7 7 6.json	7	7	Optimal	0.29	422	0.00	0.00
tai7 7 7.json	7	7	Optimal	0.04	424	0.00	0.00
tai7 7 8.json	7	7	Optimal	0.05	458	0.00	0.00
tai7 7 9.json	7	7	Optimal	0.08	398	0.00	0.00

Chapter 4

Taillard Job Shop Problems

The results are rather confusing, as some smaller problems cannot be solved to optimality, while complete groups of larger instances can. The number of jobs clearly is not the only indicator of difficulty of these problems.

4.1 Results for CPOptimizer

Table 4.1: Results for Taillard JobShop (CPO) (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 20 0.json	100	20	Optimal	444.79	5464	5464.00	0.00
tai100 20 1.json	100	20	Optimal	129.42	5181	5181.00	0.00
tai100 20 2.json	100	20	Optimal	127.22	5568	5568.00	0.00
tai100 20 3.json	100	20	Optimal	63.90	5339	5339.00	0.00
tai100 20 4.json	100	20	Optimal	224.02	5392	5392.00	0.00
tai100 20 5.json	100	20	Optimal	199.92	5342	5342.00	0.00
tai100 20 6.json	100	20	Optimal	76.52	5436	5436.00	0.00
tai100 20 7.json	100	20	Optimal	251.01	5394	5394.00	0.00
tai100 20 8.json	100	20	Optimal	108.09	5358	5358.00	0.00
tai100 20 9.json	100	20	Optimal	458.28	5183	5183.00	0.00
tai15 15 0.json	15	15	Optimal	8.67	1231	1231.00	0.00
tai15 15 1.json	15	15	Optimal	38.99	1244	1244.00	0.00
tai15 15 2.json	15	15	Optimal	22.16	1218	1218.00	0.00
tai15 15 3.json	15	15	Optimal	26.67	1175	1175.00	0.00
tai15 15 4.json	15	15	Optimal	180.42	1224	1224.00	0.00
tai15 15 5.json	15	15	Solution	600.02	1238	1168.00	5.65
tai15 15 6.json	15	15	Optimal	97.97	1227	1227.00	0.00
tai15 15 7.json	15	15	Optimal	117.59	1217	1217.00	0.00
tai15 15 8.json	15	15	Optimal	133.02	1274	1274.00	0.00
tai15 15 9.json	15	15	Optimal	39.26	1241	1241.00	0.00
tai20 15 0.json	20	15	Solution	600.02	1393	1310.00	5.96
tai20 15 1.json	20	15	Solution	600.02	1373	1316.00	4.15
tai20 15 2.json	20	15	Solution	600.02	1360	1243.00	8.60

Table 4.1: Results for Taillard JobShop (CPO) (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai20 15 3.json	20	15	Optimal	113.40	1345	1345.00	0.00
tai20 15 4.json	20	15	Solution	600.02	1373	1268.00	7.65
tai20 15 5.json	20	15	Solution	600.02	1378	1302.00	5.52
tai20 15 6.json	20	15	Optimal	52.56	1462	1462.00	0.00
tai20 15 7.json	20	15	Solution	600.04	1425	1358.00	4.70
tai20 15 8.json	20	15	Solution	600.02	1366	1257.00	7.98
tai20 15 9.json	20	15	Solution	600.02	1360	1300.00	4.41
tai20 20 0.json	20	20	Solution	600.03	1687	1508.00	10.61
tai20 20 1.json	20	20	Solution	600.02	1651	1468.00	11.08
tai20 20 2.json	20	20	Solution	600.02	1561	1461.00	6.41
tai20 20 3.json	20	20	Solution	600.03	1650	1595.00	3.33
tai20 20 4.json	20	20	Solution	600.02	1619	1520.00	6.11
tai20 20 5.json	20	20	Solution	600.02	1676	1502.00	10.38
tai20 20 6.json	20	20	Solution	600.03	1694	1619.00	4.43
tai20 20 7.json	20	20	Solution	600.02	1614	1561.00	3.28
tai20 20 8.json	20	20	Solution	600.02	1642	1518.00	7.55
tai20 20 9.json	20	20	Solution	600.03	1640	1424.00	13.17
tai30 15 0.json	30	15	Solution	600.03	1766	1764.00	0.11
tai30 15 1.json	30	15	Solution	600.02	1845	1774.00	3.85
tai30 15 2.json	30	15	Solution	600.03	1842	1774.00	3.69
tai30 15 3.json	30	15	Solution	600.03	1846	1828.00	0.98
tai30 15 4.json	30	15	Optimal	17.38	2007	2007.00	0.00
tai30 15 5.json	30	15	Solution	600.03	1825	1819.00	0.33
tai30 15 6.json	30	15	Solution	600.02	1791	1771.00	1.12
tai30 15 7.json	30	15	Solution	600.03	1690	1673.00	1.01
tai30 15 8.json	30	15	Solution	600.03	1821	1795.00	1.43
tai30 15 9.json	30	15	Solution	600.03	1740	1631.00	6.26
tai30 20 0.json	30	20	Solution	600.04	2061	1857.00	9.90
tai30 20 1.json	30	20	Solution	600.04	2001	1867.00	6.70
tai30 20 2.json	30	20	Solution	600.04	1889	1809.00	4.24
tai30 20 3.json	30	20	Solution	600.03	2027	1923.00	5.13
tai30 20 4.json	30	20	Solution	600.04	2037	1996.00	2.01
tai30 20 5.json	30	20	Solution	600.03	2095	1940.00	7.40
tai30 20 6.json	30	20	Solution	600.04	1959	1781.00	9.09
tai30 20 7.json	30	20	Solution	600.04	1991	1905.00	4.32
tai30 20 8.json	30	20	Solution	600.03	2027	1903.00	6.12
tai30 20 9.json	30	20	Solution	600.01	2009	1806.00	10.10
tai50 15 0.json	50	15	Optimal	51.18	2760	2760.00	0.00
tai50 15 1.json	50	15	Optimal	25.88	2756	2756.00	0.00
tai50 15 2.json	50	15	Optimal	22.48	2717	2717.00	0.00
tai50 15 3.json	50	15	Optimal	12.41	2839	2839.00	0.00
tai50 15 4.json	50	15	Optimal	56.78	2679	2679.00	0.00
tai50 15 5.json	50	15	Optimal	17.82	2781	2781.00	0.00
tai50 15 6.json	50	15	Optimal	20.21	2943	2943.00	0.00
tai50 15 7.json	50	15	Optimal	10.34	2885	2885.00	0.00

Table 4.1: Results for Taillard JobShop (CPO) (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai50 15 8.json	50	15	Optimal	65.13	2655	2655.00	0.00
tai50 15 9.json	50	15	Optimal	15.40	2723	2723.00	0.00
tai50 20 0.json	50	20	Optimal	82.49	2868	2868.00	0.00
tai50 20 1.json	50	20	Solution	600.10	2901	2869.00	1.10
tai50 20 2.json	50	20	Optimal	436.81	2755	2755.00	0.00
tai50 20 3.json	50	20	Optimal	250.89	2702	2702.00	0.00
tai50 20 4.json	50	20	Optimal	500.55	2725	2725.00	0.00
tai50 20 5.json	50	20	Solution	600.10	2881	2845.00	1.25
tai50 20 6.json	50	20	Solution	600.11	2826	2825.00	0.04
tai50 20 7.json	50	20	Optimal	164.25	2784	2784.00	0.00
tai50 20 8.json	50	20	Optimal	79.35	3071	3071.00	0.00
tai50 20 9.json	50	20	Optimal	386.69	2995	2995.00	0.00

4.2 Results for CPSat

Table 4.2: Results for Taillard JobShop (CPSat) (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 20 0.json	100	20	Solution	600.17	5616	3654.00	34.94
tai100 20 1.json	100	20	Solution	600.30	5282	3437.00	34.93
tai100 20 2.json	100	20	Optimal	529.40	5568	5568.00	0.00
tai100 20 3.json	100	20	Solution	600.19	5356	3514.00	34.39
tai100 20 4.json	100	20	Solution	600.18	5656	3629.00	35.84
tai100 20 5.json	100	20	Solution	600.17	5411	3554.00	34.32
tai100 20 6.json	100	20	Solution	600.20	5473	3513.00	35.81
tai100 20 7.json	100	20	Solution	600.22	5431	3639.00	33.00
tai100 20 8.json	100	20	Solution	601.09	5409	3610.00	33.26
tai100 20 9.json	100	20	Solution	600.37	5288	3577.00	32.36
tai15 15 0.json	15	15	Optimal	5.32	1231	1231.00	0.00
tai15 15 1.json	15	15	Optimal	44.73	1244	1244.00	0.00
tai15 15 2.json	15	15	Optimal	18.76	1218	1218.00	0.00
tai15 15 3.json	15	15	Optimal	19.12	1175	1175.00	0.00
tai15 15 4.json	15	15	Optimal	216.74	1224	1224.00	0.00
tai15 15 5.json	15	15	Solution	600.10	1238	1202.00	2.91
tai15 15 6.json	15	15	Optimal	246.22	1227	1227.00	0.00
tai15 15 7.json	15	15	Optimal	186.11	1217	1217.00	0.00
tai15 15 8.json	15	15	Optimal	134.40	1274	1274.00	0.00
tai15 15 9.json	15	15	Optimal	20.74	1241	1241.00	0.00
tai20 15 0.json	20	15	Solution	600.11	1368	1309.00	4.31
tai20 15 1.json	20	15	Solution	600.10	1379	1351.00	2.03
tai20 15 2.json	20	15	Solution	600.10	1356	1277.00	5.83

Table 4.2: Results for Taillard JobShop (CPSat) (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai20 15 3.json	20	15	Optimal	9.54	1345	1345.00	0.00
tai20 15 4.json	20	15	Solution	600.13	1355	1301.00	3.99
tai20 15 5.json	20	15	Solution	600.27	1360	1296.00	4.71
tai20 15 6.json	20	15	Optimal	153.89	1462	1462.00	0.00
tai20 15 7.json	20	15	Solution	600.09	1417	1359.00	4.09
tai20 15 8.json	20	15	Solution	600.29	1336	1297.00	2.92
tai20 15 9.json	20	15	Solution	600.10	1355	1315.00	2.95
tai20 20 0.json	20	20	Solution	600.08	1666	1572.00	5.64
tai20 20 1.json	20	20	Solution	600.09	1630	1524.00	6.50
tai20 20 2.json	20	20	Solution	600.21	1565	1491.00	4.73
tai20 20 3.json	20	20	Solution	600.13	1647	1611.00	2.19
tai20 20 4.json	20	20	Solution	600.09	1598	1524.00	4.63
tai20 20 5.json	20	20	Solution	600.15	1663	1557.00	6.37
tai20 20 6.json	20	20	Solution	600.15	1700	1621.00	4.65
tai20 20 7.json	20	20	Solution	600.11	1614	1585.00	1.80
tai20 20 8.json	20	20	Solution	600.10	1640	1529.00	6.77
tai20 20 9.json	20	20	Solution	600.11	1600	1478.00	7.63
tai30 15 0.json	30	15	Solution	600.11	1778	1764.00	0.79
tai30 15 1.json	30	15	Solution	600.20	1851	1774.00	4.16
tai30 15 2.json	30	15	Solution	600.15	1842	1783.00	3.20
tai30 15 3.json	30	15	Solution	600.11	1866	1828.00	2.04
tai30 15 4.json	30	15	Optimal	9.97	2007	2007.00	0.00
tai30 15 5.json	30	15	Solution	600.20	1828	1819.00	0.49
tai30 15 6.json	30	15	Solution	600.12	1815	1771.00	2.42
tai30 15 7.json	30	15	Solution	600.11	1704	1673.00	1.82
tai30 15 8.json	30	15	Optimal	370.42	1795	1795.00	0.00
tai30 15 9.json	30	15	Solution	600.09	1737	1642.00	5.47
tai30 20 0.json	30	20	Solution	600.13	2127	1889.00	11.19
tai30 20 1.json	30	20	Solution	600.13	2019	1873.00	7.23
tai30 20 2.json	30	20	Solution	600.12	1926	1809.00	6.07
tai30 20 3.json	30	20	Solution	600.10	2051	1936.00	5.61
tai30 20 4.json	30	20	Solution	600.12	2100	1997.00	4.90
tai30 20 5.json	30	20	Solution	600.10	2053	1943.00	5.36
tai30 20 6.json	30	20	Solution	600.11	1979	1797.00	9.20
tai30 20 7.json	30	20	Solution	600.12	2001	1912.00	4.45
tai30 20 8.json	30	20	Solution	600.13	2050	1926.00	6.05
tai30 20 9.json	30	20	Solution	600.11	1991	1819.00	8.64
tai50 15 0.json	50	15	Optimal	186.33	2760	2760.00	0.00
tai50 15 1.json	50	15	Optimal	155.63	2756	2756.00	0.00
tai50 15 2.json	50	15	Optimal	68.58	2717	2717.00	0.00
tai50 15 3.json	50	15	Optimal	26.60	2839	2839.00	0.00
tai50 15 4.json	50	15	Optimal	362.73	2679	2679.00	0.00
tai50 15 5.json	50	15	Optimal	249.56	2781	2781.00	0.00
tai50 15 6.json	50	15	Optimal	120.38	2943	2943.00	0.00
tai50 15 7.json	50	15	Optimal	216.50	2885	2885.00	0.00

Table 4.2: Results for Taillard JobShop (CPSat) (80 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai50 15 8.json	50	15	Optimal	435.42	2655	2655.00	0.00
tai50 15 9.json	50	15	Optimal	217.29	2723	2723.00	0.00
tai50 20 0.json	50	20	Solution	600.15	2881	2868.00	0.45
tai50 20 1.json	50	20	Solution	600.22	2981	2869.00	3.76
tai50 20 2.json	50	20	Solution	600.31	2797	2755.00	1.50
tai50 20 3.json	50	20	Solution	600.19	2738	2702.00	1.31
tai50 20 4.json	50	20	Solution	600.18	2805	2725.00	2.85
tai50 20 5.json	50	20	Solution	600.24	2895	2845.00	1.73
tai50 20 6.json	50	20	Solution	600.16	2872	2825.00	1.64
tai50 20 7.json	50	20	Solution	600.19	2829	2784.00	1.59
tai50 20 8.json	50	20	Optimal	302.62	3071	3071.00	0.00
tai50 20 9.json	50	20	Solution	600.25	3046	2995.00	1.67

4.3 Sample Results on Mac (CPOptimizer)

For a selected subset of the tests, we also tried running on a mac laptop, results show some good improvement of the m2 based laptop over the Intel based Windows machine, but the improvements are not consistent.

Table 4.3: Results for Taillard Jobshop (Selected Instances on Mac)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 20 0.json	100	20	Optimal	143.93	5464	5464.00	0.00
tai100 20 1.json	100	20	Optimal	86.52	5181	5181.00	0.00
tai100 20 2.json	100	20	Optimal	63.63	5568	5568.00	0.00
tai100 20 3.json	100	20	Optimal	19.51	5339	5339.00	0.00
tai100 20 4.json	100	20	Optimal	174.11	5392	5392.00	0.00
tai100 20 5.json	100	20	Optimal	80.95	5342	5342.00	0.00
tai100 20 6.json	100	20	Optimal	139.30	5436	5436.00	0.00
tai100 20 7.json	100	20	Optimal	48.86	5394	5394.00	0.00
tai100 20 8.json	100	20	Optimal	82.22	5358	5358.00	0.00
tai100 20 9.json	100	20	Optimal	143.55	5183	5183.00	0.00

Chapter 5

Taillard Flow Shop Problems

These problems seem to be more difficult to solve to optimality. The number of stages seems to make a huge difference, we can solve the problems with five stages (machines) much more easily than the problems with 10 or twenty stages.

5.1 Results for CPOptimizer

Table 5.1: Results for Taillard Flowshop (CPO) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 10 0.json	100	10	Solution	600.16	5910	5759.00	2.55
tai100 10 1.json	100	10	Solution	600.06	5403	5345.00	1.07
tai100 10 2.json	100	10	Solution	600.04	5767	5646.00	2.10
tai100 10 3.json	100	10	Solution	600.05	5943	5737.00	3.47
tai100 10 4.json	100	10	Solution	600.02	5613	5431.00	3.24
tai100 10 5.json	100	10	Solution	600.05	5440	5274.00	3.05
tai100 10 6.json	100	10	Solution	600.05	5691	5553.00	2.42
tai100 10 7.json	100	10	Solution	600.06	5728	5575.00	2.67
tai100 10 8.json	100	10	Solution	600.03	6003	5838.00	2.75
tai100 10 9.json	100	10	Solution	600.04	5983	5835.00	2.47
tai100 20 0.json	100	20	Solution	600.07	6697	5914.00	11.69
tai100 20 1.json	100	20	Solution	600.04	6585	6115.00	7.14
tai100 20 2.json	100	20	Solution	600.08	6700	6139.00	8.37
tai100 20 3.json	100	20	Solution	600.06	6740	6117.00	9.24
tai100 20 4.json	100	20	Solution	600.06	6816	6148.00	9.80
tai100 20 5.json	100	20	Solution	600.06	6884	6192.00	10.05
tai100 20 6.json	100	20	Solution	600.07	6874	6045.00	12.06
tai100 20 7.json	100	20	Solution	600.06	7173	6113.00	14.78
tai100 20 8.json	100	20	Solution	600.06	6971	6014.00	13.73
tai100 20 9.json	100	20	Solution	600.04	6914	6359.00	8.03

Table 5.1: Results for Taillard Flowshop (CPO) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 5 0.json	100	5	Optimal	7.45	5493	5493.00	0.00
tai100 5 1.json	100	5	Optimal	285.63	5257	5257.00	0.00
tai100 5 2.json	100	5	Solution	600.11	5175	5169.00	0.12
tai100 5 3.json	100	5	Optimal	597.59	4993	4993.00	0.00
tai100 5 4.json	100	5	Optimal	494.76	5247	5247.00	0.00
tai100 5 5.json	100	5	Optimal	585.05	5135	5135.00	0.00
tai100 5 6.json	100	5	Optimal	193.99	5232	5232.00	0.00
tai100 5 7.json	100	5	Solution	600.13	5106	5083.00	0.45
tai100 5 8.json	100	5	Solution	600.11	5471	5438.00	0.60
tai100 5 9.json	100	5	Optimal	361.61	5318	5318.00	0.00
tai200 10 0.json	200	10	Solution	600.06	11119	10842.00	2.49
tai200 10 1.json	200	10	Solution	600.09	10958	10429.00	4.83
tai200 10 2.json	200	10	Solution	600.06	11383	10915.00	4.11
tai200 10 3.json	200	10	Solution	600.05	11102	10826.00	2.49
tai200 10 4.json	200	10	Solution	600.08	10950	10474.00	4.35
tai200 10 5.json	200	10	Solution	600.07	10912	10311.00	5.51
tai200 10 6.json	200	10	Solution	600.05	11372	10825.00	4.81
tai200 10 7.json	200	10	Solution	600.10	11090	10709.00	3.44
tai200 10 8.json	200	10	Solution	600.05	10872	10419.00	4.17
tai200 10 9.json	200	10	Solution	600.06	11147	10664.00	4.33
tai200 20 0.json	200	20	Solution	600.15	12486	11010.00	11.82
tai200 20 1.json	200	20	Solution	600.09	12886	10976.00	14.82
tai200 20 2.json	200	20	Solution	600.08	12539	11168.00	10.93
tai200 20 3.json	200	20	Solution	600.12	12739	11131.00	12.62
tai200 20 4.json	200	20	Solution	600.10	12477	11160.00	10.56
tai200 20 5.json	200	20	Solution	600.10	12683	11114.00	12.37
tai200 20 6.json	200	20	Solution	600.09	12888	11249.00	12.72
tai200 20 7.json	200	20	Solution	600.09	12461	11149.00	10.53
tai200 20 8.json	200	20	Solution	600.13	12579	11013.00	12.45
tai200 20 9.json	200	20	Solution	600.09	12821	11167.00	12.90
tai20 10 0.json	20	10	Solution	600.03	1559	1494.00	4.17
tai20 10 1.json	20	10	Solution	600.01	1675	1553.00	7.28
tai20 10 2.json	20	10	Solution	600.01	1485	1425.00	4.04
tai20 10 3.json	20	10	Optimal	141.71	1356	1356.00	0.00
tai20 10 4.json	20	10	Solution	600.03	1403	1353.00	3.56
tai20 10 5.json	20	10	Solution	600.02	1367	1340.00	1.98
tai20 10 6.json	20	10	Solution	600.02	1450	1388.00	4.28
tai20 10 7.json	20	10	Solution	600.02	1531	1415.00	7.58
tai20 10 8.json	20	10	Optimal	56.64	1586	1586.00	0.00
tai20 10 9.json	20	10	Solution	600.02	1574	1504.00	4.45
tai20 20 0.json	20	20	Solution	600.03	2294	1972.00	14.04
tai20 20 1.json	20	20	Solution	600.04	2083	1773.00	14.88
tai20 20 2.json	20	20	Solution	600.04	2280	1970.00	13.60
tai20 20 3.json	20	20	Solution	600.04	2220	1900.00	14.41
tai20 20 4.json	20	20	Solution	600.04	2314	1992.00	13.92

Table 5.1: Results for Taillard Flowshop (CPO) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai20 20 5.json	20	20	Solution	600.04	2185	1893.00	13.36
tai20 20 6.json	20	20	Solution	600.05	2289	1941.00	15.20
tai20 20 7.json	20	20	Solution	600.13	2196	1926.00	12.30
tai20 20 8.json	20	20	Solution	600.03	2230	1896.00	14.98
tai20 20 9.json	20	20	Solution	600.04	2153	1945.00	9.66
tai20 5 0.json	20	5	Optimal	2.33	1278	1278.00	0.00
tai20 5 1.json	20	5	Optimal	2.11	1358	1358.00	0.00
tai20 5 2.json	20	5	Optimal	1.47	1073	1073.00	0.00
tai20 5 3.json	20	5	Optimal	2.85	1292	1292.00	0.00
tai20 5 4.json	20	5	Optimal	6.16	1231	1231.00	0.00
tai20 5 5.json	20	5	Optimal	1.38	1193	1193.00	0.00
tai20 5 6.json	20	5	Optimal	1.40	1234	1234.00	0.00
tai20 5 7.json	20	5	Optimal	1.87	1199	1199.00	0.00
tai20 5 8.json	20	5	Optimal	1.03	1210	1210.00	0.00
tai20 5 9.json	20	5	Optimal	1.25	1103	1103.00	0.00
tai500 20 0.json	500	20	Solution	600.24	28683	25931.00	9.59
tai500 20 1.json	500	20	Solution	600.24	29001	26390.00	9.00
tai500 20 2.json	500	20	Solution	600.24	28688	26330.00	8.22
tai500 20 3.json	500	20	Solution	600.25	28883	26456.00	8.40
tai500 20 4.json	500	20	Solution	600.24	28869	26205.00	9.23
tai500 20 5.json	500	20	Solution	600.21	29025	26436.00	8.92
tai500 20 6.json	500	20	Solution	600.34	28721	26329.00	8.33
tai500 20 7.json	500	20	Solution	600.23	28926	26451.00	8.56
tai500 20 8.json	500	20	Solution	600.25	28115	25929.00	7.78
tai500 20 9.json	500	20	Solution	600.22	28693	26355.00	8.15
tai50 10 0.json	50	10	Solution	600.06	3070	2966.00	3.39
tai50 10 1.json	50	10	Solution	600.06	2928	2828.00	3.42
tai50 10 2.json	50	10	Solution	600.08	2948	2828.00	4.07
tai50 10 3.json	50	10	Solution	600.06	3123	3026.00	3.11
tai50 10 4.json	50	10	Solution	600.07	3043	2919.00	4.07
tai50 10 5.json	50	10	Solution	600.05	3062	2963.00	3.23
tai50 10 6.json	50	10	Solution	600.06	3136	3063.00	2.33
tai50 10 7.json	50	10	Solution	600.06	3097	3000.00	3.13
tai50 10 8.json	50	10	Solution	600.07	2936	2829.00	3.64
tai50 10 9.json	50	10	Solution	600.08	3158	3046.00	3.55
tai50 20 0.json	50	20	Solution	600.16	4118	3567.00	13.38
tai50 20 1.json	50	20	Solution	600.17	3979	3533.00	11.21
tai50 20 2.json	50	20	Solution	600.18	3830	3412.00	10.91
tai50 20 3.json	50	20	Solution	600.16	3920	3382.00	13.72
tai50 20 4.json	50	20	Solution	600.18	3842	3379.00	12.05
tai50 20 5.json	50	20	Solution	600.18	3905	3499.00	10.40
tai50 20 6.json	50	20	Solution	600.20	3889	3464.00	10.93
tai50 20 7.json	50	20	Solution	600.16	3907	3421.00	12.44
tai50 20 8.json	50	20	Solution	600.16	3982	3483.00	12.53
tai50 20 9.json	50	20	Solution	600.18	3996	3493.00	12.59

Table 5.1: Results for Taillard Flowshop (CPO) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai50 5 0.json	50	5	Optimal	24.03	2724	2724.00	0.00
tai50 5 1.json	50	5	Optimal	46.55	2834	2834.00	0.00
tai50 5 2.json	50	5	Optimal	28.75	2612	2612.00	0.00
tai50 5 3.json	50	5	Optimal	21.61	2751	2751.00	0.00
tai50 5 4.json	50	5	Optimal	10.51	2853	2853.00	0.00
tai50 5 5.json	50	5	Optimal	22.57	2825	2825.00	0.00
tai50 5 6.json	50	5	Optimal	56.11	2716	2716.00	0.00
tai50 5 7.json	50	5	Optimal	31.08	2683	2683.00	0.00
tai50 5 8.json	50	5	Optimal	64.19	2545	2545.00	0.00
tai50 5 9.json	50	5	Optimal	1.70	2776	2776.00	0.00

5.2 Results for CPSat

Table 5.2: Results for Taillard Flowshop (CPSat) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 10 0.json	100	10	Solution	600.16	6457	5759.00	10.81
tai100 10 1.json	100	10	Solution	600.14	5938	5345.00	9.99
tai100 10 2.json	100	10	Solution	600.17	6110	5654.00	7.46
tai100 10 3.json	100	10	Solution	600.13	6401	5745.00	10.25
tai100 10 4.json	100	10	Solution	600.27	6049	5437.00	10.12
tai100 10 5.json	100	10	Solution	600.17	5732	5274.00	7.99
tai100 10 6.json	100	10	Solution	600.13	6099	5556.00	8.90
tai100 10 7.json	100	10	Solution	600.16	6201	5586.00	9.92
tai100 10 8.json	100	10	Solution	600.15	6381	5844.00	8.42
tai100 10 9.json	100	10	Solution	600.16	6202	5845.00	5.76
tai100 20 0.json	100	20	Solution	600.17	7409	5939.00	19.84
tai100 20 1.json	100	20	Solution	600.18	7122	6122.00	14.04
tai100 20 2.json	100	20	Solution	600.23	7422	6163.00	16.96
tai100 20 3.json	100	20	Solution	600.16	7033	6117.00	13.02
tai100 20 4.json	100	20	Solution	600.27	7373	6162.00	16.42
tai100 20 5.json	100	20	Solution	601.25	7664	6196.00	19.15
tai100 20 6.json	100	20	Solution	601.48	7247	6060.00	16.38
tai100 20 7.json	100	20	Solution	600.23	7689	6139.00	20.16
tai100 20 8.json	100	20	Solution	601.46	7424	6045.00	18.57
tai100 20 9.json	100	20	Solution	600.18	7395	6359.00	14.01
tai100 5 0.json	100	5	Solution	600.20	5495	5493.00	0.04
tai100 5 1.json	100	5	Solution	600.13	5285	5257.00	0.53
tai100 5 2.json	100	5	Solution	600.17	5221	5173.00	0.92
tai100 5 3.json	100	5	Solution	600.22	5022	4993.00	0.58
tai100 5 4.json	100	5	Solution	600.16	5261	5247.00	0.27

Table 5.2: Results for Taillard Flowshop (CPSat) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 5 5.json	100	5	Solution	600.23	5145	5135.00	0.19
tai100 5 6.json	100	5	Solution	600.23	5294	5228.00	1.25
tai100 5 7.json	100	5	Solution	600.17	5130	5083.00	0.92
tai100 5 8.json	100	5	Solution	600.24	5476	5442.00	0.62
tai100 5 9.json	100	5	Solution	600.31	5356	5310.00	0.86
tai200 10 0.json	200	10	Solution	600.28	12038	10842.00	9.94
tai200 10 1.json	200	10	Solution	600.21	12337	10430.00	15.46
tai200 10 2.json	200	10	Solution	600.27	12103	10915.00	9.82
tai200 10 3.json	200	10	Solution	600.22	11962	10846.00	9.33
tai200 10 4.json	200	10	Solution	600.22	12038	10472.00	13.01
tai200 10 5.json	200	10	Solution	600.22	11692	10311.00	11.81
tai200 10 6.json	200	10	Solution	600.27	12217	10832.00	11.34
tai200 10 7.json	200	10	Solution	601.23	12155	10710.00	11.89
tai200 10 8.json	200	10	Solution	600.26	11834	10419.00	11.96
tai200 10 9.json	200	10	Solution	600.25	11758	10666.00	9.29
tai200 20 0.json	200	20	Solution	600.37	13306	11005.00	17.29
tai200 20 1.json	200	20	Solution	600.94	13314	10976.00	17.56
tai200 20 2.json	200	20	Solution	600.32	13299	11169.00	16.02
tai200 20 3.json	200	20	Solution	600.33	13544	11132.00	17.81
tai200 20 4.json	200	20	Solution	600.33	13291	11162.00	16.02
tai200 20 5.json	200	20	Solution	600.35	13557	11117.00	18.00
tai200 20 6.json	200	20	Solution	601.68	13575	11251.00	17.12
tai200 20 7.json	200	20	Solution	600.34	13208	11157.00	15.53
tai200 20 8.json	200	20	Solution	601.09	13322	10999.00	17.44
tai200 20 9.json	200	20	Solution	601.14	13557	11162.00	17.67
tai20 10 0.json	20	10	Solution	600.17	1574	1548.00	1.65
tai20 10 1.json	20	10	Solution	600.33	1674	1587.00	5.20
tai20 10 2.json	20	10	Solution	600.12	1479	1438.00	2.77
tai20 10 3.json	20	10	Solution	600.13	1376	1356.00	1.45
tai20 10 4.json	20	10	Solution	600.14	1424	1361.00	4.42
tai20 10 5.json	20	10	Solution	600.16	1383	1356.00	1.95
tai20 10 6.json	20	10	Solution	600.13	1446	1398.00	3.32
tai20 10 7.json	20	10	Solution	600.14	1531	1448.00	5.42
tai20 10 8.json	20	10	Optimal	235.18	1586	1586.00	0.00
tai20 10 9.json	20	10	Solution	600.15	1559	1529.00	1.92
tai20 20 0.json	20	20	Solution	600.12	2332	2048.00	12.18
tai20 20 1.json	20	20	Solution	600.12	2092	1852.00	11.47
tai20 20 2.json	20	20	Solution	600.12	2394	1999.00	16.50
tai20 20 3.json	20	20	Solution	600.14	2350	1961.00	16.55
tai20 20 4.json	20	20	Solution	600.12	2289	2065.00	9.79
tai20 20 5.json	20	20	Solution	600.13	2213	1980.00	10.53
tai20 20 6.json	20	20	Solution	600.10	2291	2007.00	12.40
tai20 20 7.json	20	20	Solution	600.12	2178	1986.00	8.82
tai20 20 8.json	20	20	Solution	600.29	2312	1968.00	14.88
tai20 20 9.json	20	20	Solution	600.29	2210	1971.00	10.81

Table 5.2: Results for Taillard Flowshop (CPSat) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai20 5 0.json	20	5	Optimal	5.54	1278	1278.00	0.00
tai20 5 1.json	20	5	Optimal	1.93	1358	1358.00	0.00
tai20 5 2.json	20	5	Optimal	3.14	1073	1073.00	0.00
tai20 5 3.json	20	5	Optimal	6.82	1292	1292.00	0.00
tai20 5 4.json	20	5	Optimal	7.32	1231	1231.00	0.00
tai20 5 5.json	20	5	Optimal	5.25	1193	1193.00	0.00
tai20 5 6.json	20	5	Optimal	4.38	1234	1234.00	0.00
tai20 5 7.json	20	5	Optimal	4.85	1199	1199.00	0.00
tai20 5 8.json	20	5	Optimal	0.92	1210	1210.00	0.00
tai20 5 9.json	20	5	Optimal	3.82	1103	1103.00	0.00
tai500 20 0.json	500	20	Solution	607.49	30253	13560.00	55.18
tai500 20 1.json	500	20	Solution	601.41	30898	13905.00	55.00
tai500 20 2.json	500	20	Solution	608.27	30581	13845.00	54.73
tai500 20 3.json	500	20	Solution	604.80	30583	13868.00	54.65
tai500 20 4.json	500	20	Solution	608.12	30483	13744.00	54.91
tai500 20 5.json	500	20	Solution	601.34	30860	13724.00	55.53
tai500 20 6.json	500	20	Solution	601.33	30742	13840.00	54.98
tai500 20 7.json	500	20	Solution	603.96	30740	13927.00	54.69
tai500 20 8.json	500	20	Solution	608.54	30365	13646.00	55.06
tai500 20 9.json	500	20	Solution	601.47	30675	13785.00	55.06
tai50 10 0.json	50	10	Solution	600.19	3209	2976.00	7.26
tai50 10 1.json	50	10	Solution	600.19	3017	2829.00	6.23
tai50 10 2.json	50	10	Solution	600.16	3016	2830.00	6.17
tai50 10 3.json	50	10	Solution	600.16	3235	3059.00	5.44
tai50 10 4.json	50	10	Solution	600.16	3168	2933.00	7.42
tai50 10 5.json	50	10	Solution	600.15	3156	2985.00	5.42
tai50 10 6.json	50	10	Solution	600.15	3256	3093.00	5.01
tai50 10 7.json	50	10	Solution	600.15	3203	3003.00	6.24
tai50 10 8.json	50	10	Solution	600.32	3006	2864.00	4.72
tai50 10 9.json	50	10	Solution	600.22	3245	3046.00	6.13
tai50 20 0.json	50	20	Solution	600.16	4187	3593.00	14.19
tai50 20 1.json	50	20	Solution	600.18	4104	3554.00	13.40
tai50 20 2.json	50	20	Solution	600.18	4017	3432.00	14.56
tai50 20 3.json	50	20	Solution	600.18	4294	3420.00	20.35
tai50 20 4.json	50	20	Solution	600.16	4164	3412.00	18.06
tai50 20 5.json	50	20	Solution	600.14	4083	3516.00	13.89
tai50 20 6.json	50	20	Solution	600.24	4115	3499.00	14.97
tai50 20 7.json	50	20	Solution	600.19	4121	3454.00	16.19
tai50 20 8.json	50	20	Solution	600.19	4102	3490.00	14.92
tai50 20 9.json	50	20	Solution	600.19	4222	3519.00	16.65
tai50 5 0.json	50	5	Optimal	50.65	2724	2724.00	0.00
tai50 5 1.json	50	5	Optimal	40.78	2834	2834.00	0.00
tai50 5 2.json	50	5	Optimal	90.65	2612	2612.00	0.00
tai50 5 3.json	50	5	Optimal	61.30	2751	2751.00	0.00
tai50 5 4.json	50	5	Optimal	27.88	2853	2853.00	0.00

Table 5.2: Results for Taillard Flowshop (CPSat) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai50 5 5.json	50	5	Optimal	36.25	2825	2825.00	0.00
tai50 5 6.json	50	5	Optimal	399.71	2716	2716.00	0.00
tai50 5 7.json	50	5	Optimal	52.87	2683	2683.00	0.00
tai50 5 8.json	50	5	Optimal	161.70	2545	2545.00	0.00
tai50 5 9.json	50	5	Optimal	34.36	2776	2776.00	0.00

5.3 Permutation Flowshop Results for CPOptimizer

We can run the flowshop benchmarks with an additional constraint to be solved as a permutation flowshop, which dramatically reduces the sets of feasible solutions, and the search tree to be searched. This might results in improved solutions found as a larger part of that search space can be explored, but solutions can be worse than for the original problem. In particular the optimal solution for the permutation flowshop can be worse than a good feasible solution for the unrestricted flowshop.

Table 5.3: Results for Taillard Permutation Flowshop (CPO) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 10 0.json	100	10	Solution	600.34	5789	5766.00	0.40
tai100 10 1.json	100	10	Solution	600.07	5391	5347.00	0.82
tai100 10 2.json	100	10	Solution	600.08	5691	5659.00	0.56
tai100 10 3.json	100	10	Solution	600.06	5860	5776.00	1.43
tai100 10 4.json	100	10	Solution	600.05	5513	5450.00	1.14
tai100 10 5.json	100	10	Solution	600.03	5308	5290.00	0.34
tai100 10 6.json	100	10	Solution	600.03	5647	5556.00	1.61
tai100 10 7.json	100	10	Solution	600.03	5689	5586.00	1.81
tai100 10 8.json	100	10	Solution	600.05	5903	5865.00	0.64
tai100 10 9.json	100	10	Solution	600.04	5860	5837.00	0.39
tai100 20 0.json	100	20	Solution	600.05	6526	5936.00	9.04
tai100 20 1.json	100	20	Solution	600.07	6390	6122.00	4.19
tai100 20 2.json	100	20	Solution	600.07	6481	6162.00	4.92
tai100 20 3.json	100	20	Solution	600.08	6463	6163.00	4.64
tai100 20 4.json	100	20	Solution	600.05	6497	6161.00	5.17
tai100 20 5.json	100	20	Solution	600.05	6554	6203.00	5.36
tai100 20 6.json	100	20	Solution	600.07	6483	6061.00	6.51
tai100 20 7.json	100	20	Solution	600.08	6670	6190.00	7.20
tai100 20 8.json	100	20	Solution	600.05	6577	6063.00	7.82
tai100 20 9.json	100	20	Solution	600.06	6684	6382.00	4.52
tai100 5 0.json	100	5	Optimal	4.06	5493	5493.00	0.00

Table 5.3: Results for Taillard Permutation Flowshop (CPO) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai100 5 1.json	100	5	Optimal	67.53	5268	5268.00	0.00
tai100 5 2.json	100	5	Optimal	7.66	5175	5175.00	0.00
tai100 5 3.json	100	5	Optimal	60.38	5014	5014.00	0.00
tai100 5 4.json	100	5	Optimal	62.17	5250	5250.00	0.00
tai100 5 5.json	100	5	Optimal	6.22	5135	5135.00	0.00
tai100 5 6.json	100	5	Optimal	9.45	5246	5246.00	0.00
tai100 5 7.json	100	5	Optimal	9.90	5094	5094.00	0.00
tai100 5 8.json	100	5	Optimal	65.13	5448	5448.00	0.00
tai100 5 9.json	100	5	Optimal	67.74	5322	5322.00	0.00
tai200 10 0.json	200	10	Solution	600.05	10918	10861.00	0.52
tai200 10 1.json	200	10	Solution	600.07	10718	10447.00	2.53
tai200 10 2.json	200	10	Solution	600.05	11060	10920.00	1.27
tai200 10 3.json	200	10	Solution	600.07	10934	10846.00	0.80
tai200 10 4.json	200	10	Solution	600.08	10626	10494.00	1.24
tai200 10 5.json	200	10	Solution	600.07	10453	10312.00	1.35
tai200 10 6.json	200	10	Solution	600.07	10979	10853.00	1.15
tai200 10 7.json	200	10	Solution	600.07	10856	10715.00	1.30
tai200 10 8.json	200	10	Solution	600.06	10558	10422.00	1.29
tai200 10 9.json	200	10	Solution	600.05	10761	10666.00	0.88
tai200 20 0.json	200	20	Solution	600.13	11928	11048.00	7.38
tai200 20 1.json	200	20	Solution	600.09	11991	11009.00	8.19
tai200 20 2.json	200	20	Solution	600.09	12248	11217.00	8.42
tai200 20 3.json	200	20	Solution	600.12	11967	11179.00	6.58
tai200 20 4.json	200	20	Solution	600.13	11915	11168.00	6.27
tai200 20 5.json	200	20	Solution	600.08	11923	11159.00	6.41
tai200 20 6.json	200	20	Solution	600.10	12205	11269.00	7.67
tai200 20 7.json	200	20	Solution	600.10	12221	11216.00	8.22
tai200 20 8.json	200	20	Solution	600.12	11991	11054.00	7.81
tai200 20 9.json	200	20	Solution	600.11	12022	11242.00	6.49
tai20 10 0.json	20	10	Optimal	292.19	1582	1582.00	0.00
tai20 10 1.json	20	10	Solution	600.02	1659	1580.00	4.76
tai20 10 2.json	20	10	Optimal	587.59	1496	1496.00	0.00
tai20 10 3.json	20	10	Optimal	62.06	1377	1377.00	0.00
tai20 10 4.json	20	10	Optimal	101.03	1419	1419.00	0.00
tai20 10 5.json	20	10	Optimal	119.12	1397	1397.00	0.00
tai20 10 6.json	20	10	Solution	600.02	1484	1399.00	5.73
tai20 10 7.json	20	10	Optimal	357.94	1538	1538.00	0.00
tai20 10 8.json	20	10	Optimal	31.26	1593	1593.00	0.00
tai20 10 9.json	20	10	Solution	600.04	1603	1492.00	6.92
tai20 20 0.json	20	20	Solution	600.04	2340	2010.00	14.10
tai20 20 1.json	20	20	Solution	600.03	2130	1823.00	14.41
tai20 20 2.json	20	20	Solution	600.04	2329	1945.00	16.49
tai20 20 3.json	20	20	Solution	600.04	2229	1933.00	13.28
tai20 20 4.json	20	20	Solution	600.02	2324	2034.00	12.48

Table 5.3: Results for Taillard Permutation Flowshop (CPO) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai20 20 5.json	20	20	Solution	600.04	2235	1967.00	11.99
tai20 20 6.json	20	20	Solution	600.05	2291	1976.00	13.75
tai20 20 7.json	20	20	Solution	600.04	2222	1936.00	12.87
tai20 20 8.json	20	20	Solution	600.04	2250	1909.00	15.16
tai20 20 9.json	20	20	Solution	600.02	2189	1954.00	10.74
tai20 5 0.json	20	5	Optimal	0.79	1278	1278.00	0.00
tai20 5 1.json	20	5	Optimal	0.39	1359	1359.00	0.00
tai20 5 2.json	20	5	Optimal	0.76	1081	1081.00	0.00
tai20 5 3.json	20	5	Optimal	1.38	1293	1293.00	0.00
tai20 5 4.json	20	5	Optimal	4.98	1235	1235.00	0.00
tai20 5 5.json	20	5	Optimal	0.45	1195	1195.00	0.00
tai20 5 6.json	20	5	Optimal	0.37	1234	1234.00	0.00
tai20 5 7.json	20	5	Optimal	1.22	1206	1206.00	0.00
tai20 5 8.json	20	5	Optimal	0.65	1230	1230.00	0.00
tai20 5 9.json	20	5	Optimal	0.58	1108	1108.00	0.00
tai500 20 0.json	500	20	Solution	600.40	28935	25955.00	10.30
tai500 20 1.json	500	20	Solution	600.21	29270	26432.00	9.70
tai500 20 2.json	500	20	Solution	600.25	28956	26330.00	9.07
tai500 20 3.json	500	20	Solution	600.21	28977	26456.00	8.70
tai500 20 4.json	500	20	Solution	600.23	28999	26263.00	9.43
tai500 20 5.json	500	20	Solution	600.28	28939	26440.00	8.64
tai500 20 6.json	500	20	Solution	600.27	28709	26362.00	8.18
tai500 20 7.json	500	20	Solution	600.29	29115	26514.00	8.93
tai500 20 8.json	500	20	Solution	600.22	28659	25952.00	9.45
tai500 20 9.json	500	20	Solution	600.25	28948	26429.00	8.70
tai50 10 0.json	50	10	Solution	600.09	3039	2967.00	2.37
tai50 10 1.json	50	10	Solution	600.09	2933	2829.00	3.55
tai50 10 2.json	50	10	Solution	600.11	2921	2828.00	3.18
tai50 10 3.json	50	10	Optimal	535.73	3063	3063.00	0.00
tai50 10 4.json	50	10	Solution	600.10	3021	2928.00	3.08
tai50 10 5.json	50	10	Solution	600.12	3050	2987.00	2.07
tai50 10 6.json	50	10	Solution	600.10	3124	3065.00	1.89
tai50 10 7.json	50	10	Solution	600.05	3040	3037.00	0.10
tai50 10 8.json	50	10	Solution	600.12	2902	2883.00	0.65
tai50 10 9.json	50	10	Solution	600.06	3121	3046.00	2.40
tai50 20 0.json	50	20	Solution	600.21	3931	3591.00	8.65
tai50 20 1.json	50	20	Solution	600.24	3812	3534.00	7.29
tai50 20 2.json	50	20	Solution	600.24	3756	3428.00	8.73
tai50 20 3.json	50	20	Solution	600.24	3817	3453.00	9.54
tai50 20 4.json	50	20	Solution	600.20	3736	3389.00	9.29
tai50 20 5.json	50	20	Solution	600.17	3784	3535.00	6.58
tai50 20 6.json	50	20	Solution	600.18	3799	3495.00	8.00
tai50 20 7.json	50	20	Solution	600.18	3836	3443.00	10.25
tai50 20 8.json	50	20	Solution	600.22	3908	3482.00	10.90

Table 5.3: Results for Taillard Permutation Flowshop (CPO) (120 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
tai50 20 9.json	50	20	Solution	600.16	3857	3538.00	8.27
tai50 5 0.json	50	5	Optimal	1.24	2724	2724.00	0.00
tai50 5 1.json	50	5	Optimal	2.71	2834	2834.00	0.00
tai50 5 2.json	50	5	Optimal	32.80	2621	2621.00	0.00
tai50 5 3.json	50	5	Optimal	1.66	2751	2751.00	0.00
tai50 5 4.json	50	5	Optimal	2.22	2863	2863.00	0.00
tai50 5 5.json	50	5	Optimal	3.09	2829	2829.00	0.00
tai50 5 6.json	50	5	Optimal	14.28	2725	2725.00	0.00
tai50 5 7.json	50	5	Optimal	2.61	2683	2683.00	0.00
tai50 5 8.json	50	5	Optimal	3.82	2552	2552.00	0.00
tai50 5 9.json	50	5	Optimal	2.03	2782	2782.00	0.00

Chapter 6

SALBP-1 Assembly Line Balancing Problems

The assembly line balancing problems have a single cumulative and no disjunctive constraints, so the indicated number of (disjunctive) machines is zero.

The larger problem instances are still missing. For the small instances (20 tasks), only a few are not solved to optimality, for the medium sizes the number of optimal solutions found is reduced, and for larger instances, optimal solutions are rare.

6.1 Results for CPOptimizer

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 1.alb	1	0	Solution	30.10	136	135.00	0.74
instance n=1000 10.alb	1	0	Solution	30.08	141	140.00	0.71
instance n=1000 100.alb	1	0	Solution	30.10	139	137.00	1.44
instance n=1000 101.alb	1	0	Solution	30.18	558	505.00	9.50
instance n=1000 102.alb	1	0	Solution	30.18	557	503.00	9.69
instance n=1000 103.alb	1	0	Solution	30.19	562	503.00	10.50
instance n=1000 104.alb	1	0	Solution	30.21	555	504.00	9.19
instance n=1000 105.alb	1	0	Solution	30.16	549	499.00	9.11
instance n=1000 106.alb	1	0	Solution	30.18	556	499.00	10.25
instance n=1000 107.alb	1	0	Solution	30.17	540	496.00	8.15
instance n=1000 108.alb	1	0	Solution	30.18	546	498.00	8.79
instance n=1000 109.alb	1	0	Solution	30.19	550	500.00	9.09
instance n=1000 11.alb	1	0	Solution	30.05	135	134.00	0.74
instance n=1000 110.alb	1	0	Solution	30.23	557	501.00	10.05
instance n=1000 111.alb	1	0	Solution	30.19	550	500.00	9.09
instance n=1000 112.alb	1	0	Solution	30.19	550	499.00	9.27
instance n=1000 113.alb	1	0	Solution	30.22	543	495.00	8.84

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 114.alb	1	0	Solution	30.19	552	502.00	9.06
instance n=1000 115.alb	1	0	Solution	30.20	542	498.00	8.12
instance n=1000 116.alb	1	0	Solution	30.16	546	496.00	9.16
instance n=1000 117.alb	1	0	Solution	30.20	552	500.00	9.42
instance n=1000 118.alb	1	0	Solution	30.19	566	509.00	10.07
instance n=1000 119.alb	1	0	Solution	30.20	532	496.00	6.77
instance n=1000 12.alb	1	0	Solution	30.05	135	134.00	0.74
instance n=1000 120.alb	1	0	Solution	30.16	549	502.00	8.56
instance n=1000 121.alb	1	0	Solution	30.20	542	496.00	8.49
instance n=1000 122.alb	1	0	Solution	30.17	535	493.00	7.85
instance n=1000 123.alb	1	0	Solution	30.16	557	504.00	9.52
instance n=1000 124.alb	1	0	Solution	30.25	544	498.00	8.46
instance n=1000 125.alb	1	0	Solution	30.17	546	499.00	8.61
instance n=1000 126.alb	1	0	Solution	30.09	232	228.00	1.72
instance n=1000 127.alb	1	0	Solution	30.10	224	221.00	1.34
instance n=1000 128.alb	1	0	Solution	30.10	225	222.00	1.33
instance n=1000 129.alb	1	0	Solution	30.16	226	223.00	1.33
instance n=1000 13.alb	1	0	Solution	30.12	132	131.00	0.76
instance n=1000 130.alb	1	0	Solution	30.10	225	221.00	1.78
instance n=1000 131.alb	1	0	Solution	30.08	223	220.00	1.35
instance n=1000 132.alb	1	0	Solution	30.10	218	214.00	1.83
instance n=1000 133.alb	1	0	Solution	30.10	230	226.00	1.74
instance n=1000 134.alb	1	0	Solution	30.12	219	215.00	1.83
instance n=1000 135.alb	1	0	Solution	30.14	229	225.00	1.75
instance n=1000 136.alb	1	0	Solution	30.11	233	228.00	2.15
instance n=1000 137.alb	1	0	Solution	30.19	217	213.00	1.84
instance n=1000 138.alb	1	0	Solution	30.10	225	221.00	1.78
instance n=1000 139.alb	1	0	Solution	30.10	228	224.00	1.75
instance n=1000 14.alb	1	0	Solution	30.07	138	136.00	1.45
instance n=1000 140.alb	1	0	Solution	30.09	230	226.00	1.74
instance n=1000 141.alb	1	0	Solution	30.12	219	215.00	1.83
instance n=1000 142.alb	1	0	Solution	30.13	223	220.00	1.35
instance n=1000 143.alb	1	0	Solution	30.10	217	213.00	1.84
instance n=1000 144.alb	1	0	Solution	30.19	221	217.00	1.81
instance n=1000 145.alb	1	0	Solution	30.09	224	220.00	1.79
instance n=1000 146.alb	1	0	Solution	30.06	224	219.00	2.23
instance n=1000 147.alb	1	0	Solution	30.18	234	229.00	2.14
instance n=1000 148.alb	1	0	Solution	30.12	223	219.00	1.79
instance n=1000 149.alb	1	0	Solution	30.11	241	237.00	1.66
instance n=1000 15.alb	1	0	Solution	30.10	137	136.00	0.73
instance n=1000 150.alb	1	0	Solution	30.11	226	222.00	1.77
instance n=1000 151.alb	1	0	Solution	30.19	140	138.00	1.43
instance n=1000 152.alb	1	0	Solution	30.13	138	136.00	1.45
instance n=1000 153.alb	1	0	Solution	30.11	139	137.00	1.44
instance n=1000 154.alb	1	0	Solution	30.07	142	140.00	1.41

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 155.alb	1	0	Solution	30.13	141	139.00	1.42
instance n=1000 156.alb	1	0	Solution	30.12	143	141.00	1.40
instance n=1000 157.alb	1	0	Solution	30.10	142	140.00	1.41
instance n=1000 158.alb	1	0	Solution	30.12	137	136.00	0.73
instance n=1000 159.alb	1	0	Solution	30.13	140	138.00	1.43
instance n=1000 16.alb	1	0	Solution	30.14	138	137.00	0.72
instance n=1000 160.alb	1	0	Solution	30.11	140	138.00	1.43
instance n=1000 161.alb	1	0	Solution	30.11	134	133.00	0.75
instance n=1000 162.alb	1	0	Solution	30.15	137	136.00	0.73
instance n=1000 163.alb	1	0	Solution	30.05	141	139.00	1.42
instance n=1000 164.alb	1	0	Solution	30.08	143	141.00	1.40
instance n=1000 165.alb	1	0	Solution	30.05	137	135.00	1.46
instance n=1000 166.alb	1	0	Solution	30.15	141	139.00	1.42
instance n=1000 167.alb	1	0	Solution	30.20	141	139.00	1.42
instance n=1000 168.alb	1	0	Solution	30.13	140	138.00	1.43
instance n=1000 169.alb	1	0	Solution	30.05	136	134.00	1.47
instance n=1000 17.alb	1	0	Solution	30.08	136	135.00	0.74
instance n=1000 170.alb	1	0	Solution	30.05	136	134.00	1.47
instance n=1000 171.alb	1	0	Solution	30.17	139	137.00	1.44
instance n=1000 172.alb	1	0	Solution	30.11	136	135.00	0.74
instance n=1000 173.alb	1	0	Solution	30.09	137	135.00	1.46
instance n=1000 174.alb	1	0	Solution	30.11	138	136.00	1.45
instance n=1000 175.alb	1	0	Solution	30.11	140	138.00	1.43
instance n=1000 176.alb	1	0	Solution	30.23	559	500.00	10.55
instance n=1000 177.alb	1	0	Solution	30.17	552	499.00	9.60
instance n=1000 178.alb	1	0	Solution	30.22	568	506.00	10.92
instance n=1000 179.alb	1	0	Solution	30.25	565	505.00	10.62
instance n=1000 18.alb	1	0	Solution	30.11	135	134.00	0.74
instance n=1000 180.alb	1	0	Solution	30.22	563	503.00	10.66
instance n=1000 181.alb	1	0	Solution	30.24	567	505.00	10.93
instance n=1000 182.alb	1	0	Solution	30.20	561	502.00	10.52
instance n=1000 183.alb	1	0	Solution	30.18	552	500.00	9.42
instance n=1000 184.alb	1	0	Solution	30.18	562	502.00	10.68
instance n=1000 185.alb	1	0	Solution	30.21	565	503.00	10.97
instance n=1000 186.alb	1	0	Solution	30.23	557	500.00	10.23
instance n=1000 187.alb	1	0	Solution	30.21	569	505.00	11.25
instance n=1000 188.alb	1	0	Solution	30.21	553	498.00	9.95
instance n=1000 189.alb	1	0	Solution	30.22	556	498.00	10.43
instance n=1000 19.alb	1	0	Solution	30.14	138	137.00	0.72
instance n=1000 190.alb	1	0	Solution	30.18	556	501.00	9.89
instance n=1000 191.alb	1	0	Solution	30.18	555	501.00	9.73
instance n=1000 192.alb	1	0	Solution	30.24	559	501.00	10.38
instance n=1000 193.alb	1	0	Solution	30.20	564	503.00	10.82
instance n=1000 194.alb	1	0	Solution	30.25	561	502.00	10.52
instance n=1000 195.alb	1	0	Solution	30.18	567	502.00	11.46

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 196.alb	1	0	Solution	30.21	561	500.00	10.87
instance n=1000 197.alb	1	0	Solution	30.22	550	496.00	9.82
instance n=1000 198.alb	1	0	Solution	30.19	566	503.00	11.13
instance n=1000 199.alb	1	0	Solution	30.24	542	495.00	8.67
instance n=1000 2.alb	1	0	Solution	30.12	138	137.00	0.72
instance n=1000 20.alb	1	0	Solution	30.13	139	138.00	0.72
instance n=1000 200.alb	1	0	Solution	30.26	554	498.00	10.11
instance n=1000 201.alb	1	0	Solution	30.18	233	229.00	1.72
instance n=1000 202.alb	1	0	Solution	30.09	230	225.00	2.17
instance n=1000 203.alb	1	0	Solution	30.15	234	229.00	2.14
instance n=1000 204.alb	1	0	Solution	30.16	233	228.00	2.15
instance n=1000 205.alb	1	0	Solution	30.12	234	229.00	2.14
instance n=1000 206.alb	1	0	Solution	30.08	233	229.00	1.72
instance n=1000 207.alb	1	0	Solution	30.17	235	230.00	2.13
instance n=1000 208.alb	1	0	Solution	30.11	234	229.00	2.14
instance n=1000 209.alb	1	0	Solution	30.19	233	228.00	2.15
instance n=1000 21.alb	1	0	Solution	30.07	139	138.00	0.72
instance n=1000 210.alb	1	0	Solution	30.14	229	224.00	2.18
instance n=1000 211.alb	1	0	Solution	30.08	223	219.00	1.79
instance n=1000 212.alb	1	0	Solution	30.12	221	217.00	1.81
instance n=1000 213.alb	1	0	Solution	30.18	238	233.00	2.10
instance n=1000 214.alb	1	0	Solution	30.09	230	225.00	2.17
instance n=1000 215.alb	1	0	Solution	30.14	227	223.00	1.76
instance n=1000 216.alb	1	0	Solution	30.25	225	221.00	1.78
instance n=1000 217.alb	1	0	Solution	30.12	229	225.00	1.75
instance n=1000 218.alb	1	0	Solution	30.17	223	219.00	1.79
instance n=1000 219.alb	1	0	Solution	30.18	236	232.00	1.69
instance n=1000 22.alb	1	0	Solution	30.09	139	137.00	1.44
instance n=1000 220.alb	1	0	Solution	30.23	229	225.00	1.75
instance n=1000 221.alb	1	0	Solution	30.25	236	231.00	2.12
instance n=1000 222.alb	1	0	Solution	30.10	226	221.00	2.21
instance n=1000 223.alb	1	0	Solution	30.13	226	221.00	2.21
instance n=1000 224.alb	1	0	Solution	30.09	231	226.00	2.16
instance n=1000 225.alb	1	0	Solution	30.12	234	229.00	2.14
instance n=1000 226.alb	1	0	Solution	30.19	138	136.00	1.45
instance n=1000 227.alb	1	0	Solution	30.29	140	138.00	1.43
instance n=1000 228.alb	1	0	Solution	30.07	135	133.00	1.48
instance n=1000 229.alb	1	0	Solution	30.08	136	134.00	1.47
instance n=1000 23.alb	1	0	Solution	30.15	137	136.00	0.73
instance n=1000 230.alb	1	0	Solution	30.22	134	131.00	2.24
instance n=1000 231.alb	1	0	Solution	30.09	141	138.00	2.13
instance n=1000 232.alb	1	0	Solution	30.08	136	133.00	2.21
instance n=1000 233.alb	1	0	Solution	30.15	138	135.00	2.17
instance n=1000 234.alb	1	0	Solution	30.07	139	137.00	1.44
instance n=1000 235.alb	1	0	Solution	30.25	134	133.00	0.75

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 236.alb	1	0	Solution	30.05	138	136.00	1.45
instance n=1000 237.alb	1	0	Solution	30.12	141	138.00	2.13
instance n=1000 238.alb	1	0	Solution	30.32	140	138.00	1.43
instance n=1000 239.alb	1	0	Solution	30.30	137	135.00	1.46
instance n=1000 24.alb	1	0	Solution	30.23	141	140.00	0.71
instance n=1000 240.alb	1	0	Solution	30.15	138	135.00	2.17
instance n=1000 241.alb	1	0	Solution	30.15	140	138.00	1.43
instance n=1000 242.alb	1	0	Solution	30.18	137	135.00	1.46
instance n=1000 243.alb	1	0	Solution	30.13	139	137.00	1.44
instance n=1000 244.alb	1	0	Solution	30.28	139	137.00	1.44
instance n=1000 245.alb	1	0	Solution	30.11	137	135.00	1.46
instance n=1000 246.alb	1	0	Solution	30.19	138	135.00	2.17
instance n=1000 247.alb	1	0	Solution	30.07	141	138.00	2.13
instance n=1000 248.alb	1	0	Solution	30.23	141	138.00	2.13
instance n=1000 249.alb	1	0	Solution	30.16	141	138.00	2.13
instance n=1000 25.alb	1	0	Solution	30.08	137	136.00	0.73
instance n=1000 250.alb	1	0	Solution	30.28	142	140.00	1.41
instance n=1000 251.alb	1	0	Solution	30.20	575	502.00	12.70
instance n=1000 252.alb	1	0	Solution	30.18	574	501.00	12.72
instance n=1000 253.alb	1	0	Solution	30.17	568	502.00	11.62
instance n=1000 254.alb	1	0	Solution	30.20	569	501.00	11.95
instance n=1000 255.alb	1	0	Solution	30.20	561	498.00	11.23
instance n=1000 256.alb	1	0	Solution	30.19	562	495.00	11.92
instance n=1000 257.alb	1	0	Solution	30.21	575	502.00	12.70
instance n=1000 258.alb	1	0	Solution	30.29	565	497.00	12.04
instance n=1000 259.alb	1	0	Solution	30.30	563	496.00	11.90
instance n=1000 26.alb	1	0	Solution	30.28	555	502.00	9.55
instance n=1000 260.alb	1	0	Solution	30.20	562	495.00	11.92
instance n=1000 261.alb	1	0	Solution	30.21	570	501.00	12.11
instance n=1000 262.alb	1	0	Solution	30.19	551	495.00	10.16
instance n=1000 263.alb	1	0	Solution	30.33	567	499.00	11.99
instance n=1000 264.alb	1	0	Solution	30.19	562	499.00	11.21
instance n=1000 265.alb	1	0	Solution	30.36	586	506.00	13.65
instance n=1000 266.alb	1	0	Solution	30.22	566	500.00	11.66
instance n=1000 267.alb	1	0	Solution	30.36	576	506.00	12.15
instance n=1000 268.alb	1	0	Solution	30.21	562	497.00	11.57
instance n=1000 269.alb	1	0	Solution	30.22	561	500.00	10.87
instance n=1000 27.alb	1	0	Solution	30.21	554	502.00	9.39
instance n=1000 270.alb	1	0	Solution	30.21	584	508.00	13.01
instance n=1000 271.alb	1	0	Solution	30.18	557	497.00	10.77
instance n=1000 272.alb	1	0	Solution	30.22	572	502.00	12.24
instance n=1000 273.alb	1	0	Solution	30.38	569	500.00	12.13
instance n=1000 274.alb	1	0	Solution	30.21	565	496.00	12.21
instance n=1000 275.alb	1	0	Solution	30.18	574	504.00	12.20
instance n=1000 276.alb	1	0	Solution	30.12	223	217.00	2.69

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 277.alb	1	0	Solution	30.18	231	225.00	2.60
instance n=1000 278.alb	1	0	Solution	30.10	226	220.00	2.65
instance n=1000 279.alb	1	0	Solution	30.30	220	215.00	2.27
instance n=1000 28.alb	1	0	Solution	30.18	538	497.00	7.62
instance n=1000 280.alb	1	0	Solution	30.17	231	226.00	2.16
instance n=1000 281.alb	1	0	Solution	30.18	225	219.00	2.67
instance n=1000 282.alb	1	0	Solution	30.13	220	214.00	2.73
instance n=1000 283.alb	1	0	Solution	30.12	230	224.00	2.61
instance n=1000 284.alb	1	0	Solution	30.10	222	217.00	2.25
instance n=1000 285.alb	1	0	Solution	30.15	227	221.00	2.64
instance n=1000 286.alb	1	0	Solution	30.12	227	221.00	2.64
instance n=1000 287.alb	1	0	Solution	30.19	230	224.00	2.61
instance n=1000 288.alb	1	0	Solution	30.16	225	219.00	2.67
instance n=1000 289.alb	1	0	Solution	30.09	225	220.00	2.22
instance n=1000 29.alb	1	0	Solution	30.18	545	498.00	8.62
instance n=1000 290.alb	1	0	Solution	30.08	228	222.00	2.63
instance n=1000 291.alb	1	0	Solution	30.15	231	225.00	2.60
instance n=1000 292.alb	1	0	Solution	30.12	232	226.00	2.59
instance n=1000 293.alb	1	0	Solution	30.26	231	225.00	2.60
instance n=1000 294.alb	1	0	Solution	30.10	236	230.00	2.54
instance n=1000 295.alb	1	0	Solution	30.09	233	227.00	2.58
instance n=1000 296.alb	1	0	Solution	30.12	213	208.00	2.35
instance n=1000 297.alb	1	0	Solution	30.10	222	217.00	2.25
instance n=1000 298.alb	1	0	Solution	30.26	220	214.00	2.73
instance n=1000 299.alb	1	0	Solution	30.27	232	226.00	2.59
instance n=1000 3.alb	1	0	Solution	30.24	138	136.00	1.45
instance n=1000 30.alb	1	0	Solution	30.24	559	506.00	9.48
instance n=1000 300.alb	1	0	Solution	30.10	234	228.00	2.56
instance n=1000 301.alb	1	0	Solution	30.13	138	137.00	0.72
instance n=1000 302.alb	1	0	Solution	30.41	140	139.00	0.71
instance n=1000 303.alb	1	0	Solution	30.10	140	138.00	1.43
instance n=1000 304.alb	1	0	Solution	30.08	138	136.00	1.45
instance n=1000 305.alb	1	0	Solution	30.06	141	140.00	0.71
instance n=1000 306.alb	1	0	Solution	30.20	136	135.00	0.74
instance n=1000 307.alb	1	0	Solution	30.29	137	136.00	0.73
instance n=1000 308.alb	1	0	Solution	30.11	138	137.00	0.72
instance n=1000 309.alb	1	0	Solution	30.23	136	135.00	0.74
instance n=1000 31.alb	1	0	Solution	30.27	558	506.00	9.32
instance n=1000 310.alb	1	0	Solution	30.10	143	141.00	1.40
instance n=1000 311.alb	1	0	Solution	30.21	141	139.00	1.42
instance n=1000 312.alb	1	0	Solution	30.12	136	135.00	0.74
instance n=1000 313.alb	1	0	Solution	30.09	139	138.00	0.72
instance n=1000 314.alb	1	0	Solution	30.27	143	142.00	0.70
instance n=1000 315.alb	1	0	Solution	30.20	138	136.00	1.45
instance n=1000 316.alb	1	0	Solution	30.34	139	137.00	1.44

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 317.alb	1	0	Solution	30.09	137	136.00	0.73
instance n=1000 318.alb	1	0	Solution	30.20	139	138.00	0.72
instance n=1000 319.alb	1	0	Solution	30.18	142	140.00	1.41
instance n=1000 32.alb	1	0	Solution	30.38	543	502.00	7.55
instance n=1000 320.alb	1	0	Solution	30.05	142	141.00	0.70
instance n=1000 321.alb	1	0	Solution	30.19	141	140.00	0.71
instance n=1000 322.alb	1	0	Solution	30.14	140	139.00	0.71
instance n=1000 323.alb	1	0	Solution	30.14	140	138.00	1.43
instance n=1000 324.alb	1	0	Solution	30.06	141	140.00	0.71
instance n=1000 325.alb	1	0	Solution	30.39	140	138.00	1.43
instance n=1000 326.alb	1	0	Solution	30.19	542	496.00	8.49
instance n=1000 327.alb	1	0	Solution	30.24	554	503.00	9.21
instance n=1000 328.alb	1	0	Solution	30.25	546	500.00	8.42
instance n=1000 329.alb	1	0	Solution	30.25	555	502.00	9.55
instance n=1000 33.alb	1	0	Solution	30.31	548	501.00	8.58
instance n=1000 330.alb	1	0	Solution	30.25	538	498.00	7.43
instance n=1000 331.alb	1	0	Solution	30.21	547	498.00	8.96
instance n=1000 332.alb	1	0	Solution	30.20	535	495.00	7.48
instance n=1000 333.alb	1	0	Solution	30.21	554	499.00	9.93
instance n=1000 334.alb	1	0	Solution	30.27	540	498.00	7.78
instance n=1000 335.alb	1	0	Solution	30.24	544	496.00	8.82
instance n=1000 336.alb	1	0	Solution	30.25	534	497.00	6.93
instance n=1000 337.alb	1	0	Solution	30.20	551	501.00	9.07
instance n=1000 338.alb	1	0	Solution	30.20	553	502.00	9.22
instance n=1000 339.alb	1	0	Solution	30.21	556	500.00	10.07
instance n=1000 34.alb	1	0	Solution	30.22	563	507.00	9.95
instance n=1000 340.alb	1	0	Solution	30.27	566	505.00	10.78
instance n=1000 341.alb	1	0	Solution	30.33	552	503.00	8.88
instance n=1000 342.alb	1	0	Solution	30.21	549	500.00	8.93
instance n=1000 343.alb	1	0	Solution	30.23	556	500.00	10.07
instance n=1000 344.alb	1	0	Solution	30.20	546	500.00	8.42
instance n=1000 345.alb	1	0	Solution	30.29	554	502.00	9.39
instance n=1000 346.alb	1	0	Solution	30.21	552	501.00	9.24
instance n=1000 347.alb	1	0	Solution	30.19	547	498.00	8.96
instance n=1000 348.alb	1	0	Solution	30.44	566	506.00	10.60
instance n=1000 349.alb	1	0	Solution	30.21	559	503.00	10.02
instance n=1000 35.alb	1	0	Solution	30.22	544	501.00	7.90
instance n=1000 350.alb	1	0	Solution	30.20	534	496.00	7.12
instance n=1000 351.alb	1	0	Solution	30.27	231	227.00	1.73
instance n=1000 352.alb	1	0	Solution	30.32	231	227.00	1.73
instance n=1000 353.alb	1	0	Solution	30.30	221	217.00	1.81
instance n=1000 354.alb	1	0	Solution	30.35	226	222.00	1.77
instance n=1000 355.alb	1	0	Solution	30.20	224	220.00	1.79
instance n=1000 356.alb	1	0	Solution	30.33	230	226.00	1.74
instance n=1000 357.alb	1	0	Solution	30.43	217	213.00	1.84

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 358.alb	1	0	Solution	30.24	223	219.00	1.79
instance n=1000 359.alb	1	0	Solution	30.14	226	222.00	1.77
instance n=1000 36.alb	1	0	Solution	30.24	538	497.00	7.62
instance n=1000 360.alb	1	0	Solution	30.10	233	229.00	1.72
instance n=1000 361.alb	1	0	Solution	30.20	219	215.00	1.83
instance n=1000 362.alb	1	0	Solution	30.14	226	223.00	1.33
instance n=1000 363.alb	1	0	Solution	30.14	219	215.00	1.83
instance n=1000 364.alb	1	0	Solution	30.16	225	221.00	1.78
instance n=1000 365.alb	1	0	Solution	30.34	231	227.00	1.73
instance n=1000 366.alb	1	0	Solution	30.29	232	228.00	1.72
instance n=1000 367.alb	1	0	Solution	30.14	231	227.00	1.73
instance n=1000 368.alb	1	0	Solution	30.18	230	226.00	1.74
instance n=1000 369.alb	1	0	Solution	30.10	224	220.00	1.79
instance n=1000 37.alb	1	0	Solution	30.24	562	506.00	9.96
instance n=1000 370.alb	1	0	Solution	30.10	227	223.00	1.76
instance n=1000 371.alb	1	0	Solution	30.29	223	220.00	1.35
instance n=1000 372.alb	1	0	Solution	30.33	234	230.00	1.71
instance n=1000 373.alb	1	0	Solution	30.62	223	219.00	1.79
instance n=1000 374.alb	1	0	Solution	30.11	222	219.00	1.35
instance n=1000 375.alb	1	0	Solution	30.15	231	227.00	1.73
instance n=1000 376.alb	1	0	Solution	30.23	134	132.00	1.49
instance n=1000 377.alb	1	0	Solution	30.20	139	137.00	1.44
instance n=1000 378.alb	1	0	Solution	30.27	136	134.00	1.47
instance n=1000 379.alb	1	0	Solution	30.26	139	137.00	1.44
instance n=1000 38.alb	1	0	Solution	30.21	557	504.00	9.52
instance n=1000 380.alb	1	0	Solution	30.36	136	134.00	1.47
instance n=1000 381.alb	1	0	Solution	30.11	140	138.00	1.43
instance n=1000 382.alb	1	0	Solution	30.27	133	131.00	1.50
instance n=1000 383.alb	1	0	Solution	30.16	141	138.00	2.13
instance n=1000 384.alb	1	0	Solution	30.09	141	139.00	1.42
instance n=1000 385.alb	1	0	Solution	30.29	137	135.00	1.46
instance n=1000 386.alb	1	0	Solution	30.36	141	139.00	1.42
instance n=1000 387.alb	1	0	Solution	30.08	139	137.00	1.44
instance n=1000 388.alb	1	0	Solution	30.14	139	137.00	1.44
instance n=1000 389.alb	1	0	Solution	30.30	138	136.00	1.45
instance n=1000 39.alb	1	0	Solution	30.27	561	507.00	9.63
instance n=1000 390.alb	1	0	Solution	30.28	138	136.00	1.45
instance n=1000 391.alb	1	0	Solution	30.06	137	135.00	1.46
instance n=1000 392.alb	1	0	Solution	30.18	137	136.00	0.73
instance n=1000 393.alb	1	0	Solution	30.30	138	136.00	1.45
instance n=1000 394.alb	1	0	Solution	30.23	140	138.00	1.43
instance n=1000 395.alb	1	0	Solution	30.31	141	139.00	1.42
instance n=1000 396.alb	1	0	Solution	30.30	138	136.00	1.45
instance n=1000 397.alb	1	0	Solution	30.14	142	140.00	1.41
instance n=1000 398.alb	1	0	Solution	30.11	136	134.00	1.47

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 399.alb	1	0	Solution	30.14	140	139.00	0.71
instance n=1000 4.alb	1	0	Solution	30.40	139	138.00	0.72
instance n=1000 40.alb	1	0	Solution	30.24	531	496.00	6.59
instance n=1000 400.alb	1	0	Solution	30.15	142	140.00	1.41
instance n=1000 401.alb	1	0	Solution	30.39	556	497.00	10.61
instance n=1000 402.alb	1	0	Solution	30.39	567	500.00	11.82
instance n=1000 403.alb	1	0	Solution	30.45	562	500.00	11.03
instance n=1000 404.alb	1	0	Solution	30.23	557	500.00	10.23
instance n=1000 405.alb	1	0	Solution	30.24	567	501.00	11.64
instance n=1000 406.alb	1	0	Solution	30.34	552	495.00	10.33
instance n=1000 407.alb	1	0	Solution	30.50	564	498.00	11.70
instance n=1000 408.alb	1	0	Solution	30.88	568	501.00	11.80
instance n=1000 409.alb	1	0	Solution	30.38	568	504.00	11.27
instance n=1000 41.alb	1	0	Solution	30.25	544	500.00	8.09
instance n=1000 410.alb	1	0	Solution	30.54	580	505.00	12.93
instance n=1000 411.alb	1	0	Solution	30.26	563	498.00	11.55
instance n=1000 412.alb	1	0	Solution	30.47	565	499.00	11.68
instance n=1000 413.alb	1	0	Solution	30.25	567	503.00	11.29
instance n=1000 414.alb	1	0	Solution	30.38	563	501.00	11.01
instance n=1000 415.alb	1	0	Solution	30.24	564	501.00	11.17
instance n=1000 416.alb	1	0	Solution	30.24	567	502.00	11.46
instance n=1000 417.alb	1	0	Solution	30.23	592	512.00	13.51
instance n=1000 418.alb	1	0	Solution	30.23	560	501.00	10.54
instance n=1000 419.alb	1	0	Solution	30.23	583	510.00	12.52
instance n=1000 42.alb	1	0	Solution	30.28	533	497.00	6.75
instance n=1000 420.alb	1	0	Solution	30.47	565	501.00	11.33
instance n=1000 421.alb	1	0	Solution	30.31	561	499.00	11.05
instance n=1000 422.alb	1	0	Solution	30.29	560	495.00	11.61
instance n=1000 423.alb	1	0	Solution	30.28	565	500.00	11.50
instance n=1000 424.alb	1	0	Solution	30.21	553	495.00	10.49
instance n=1000 425.alb	1	0	Solution	30.30	572	504.00	11.89
instance n=1000 426.alb	1	0	Solution	30.33	229	224.00	2.18
instance n=1000 427.alb	1	0	Solution	30.17	235	229.00	2.55
instance n=1000 428.alb	1	0	Solution	30.14	228	224.00	1.75
instance n=1000 429.alb	1	0	Solution	30.31	240	235.00	2.08
instance n=1000 43.alb	1	0	Solution	30.21	534	496.00	7.12
instance n=1000 430.alb	1	0	Solution	30.54	224	220.00	1.79
instance n=1000 431.alb	1	0	Solution	30.14	235	230.00	2.13
instance n=1000 432.alb	1	0	Solution	30.46	232	227.00	2.16
instance n=1000 433.alb	1	0	Solution	30.12	234	229.00	2.14
instance n=1000 434.alb	1	0	Solution	30.27	215	212.00	1.40
instance n=1000 435.alb	1	0	Solution	30.34	232	227.00	2.16
instance n=1000 436.alb	1	0	Solution	30.37	231	226.00	2.16
instance n=1000 437.alb	1	0	Solution	30.32	227	222.00	2.20
instance n=1000 438.alb	1	0	Solution	30.42	226	221.00	2.21

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 439.alb	1	0	Solution	30.12	230	225.00	2.17
instance n=1000 44.alb	1	0	Solution	30.33	552	502.00	9.06
instance n=1000 440.alb	1	0	Solution	30.18	230	225.00	2.17
instance n=1000 441.alb	1	0	Solution	30.66	226	221.00	2.21
instance n=1000 442.alb	1	0	Solution	30.48	235	230.00	2.13
instance n=1000 443.alb	1	0	Solution	30.15	222	217.00	2.25
instance n=1000 444.alb	1	0	Solution	30.14	227	222.00	2.20
instance n=1000 445.alb	1	0	Solution	30.37	235	229.00	2.55
instance n=1000 446.alb	1	0	Solution	30.12	233	228.00	2.15
instance n=1000 447.alb	1	0	Solution	30.15	227	221.00	2.64
instance n=1000 448.alb	1	0	Solution	30.70	226	222.00	1.77
instance n=1000 449.alb	1	0	Solution	30.18	238	232.00	2.52
instance n=1000 45.alb	1	0	Solution	30.43	524	492.00	6.11
instance n=1000 450.alb	1	0	Solution	30.43	225	220.00	2.22
instance n=1000 451.alb	1	0	Solution	30.12	140	136.00	2.86
instance n=1000 452.alb	1	0	Solution	30.19	135	132.00	2.22
instance n=1000 453.alb	1	0	Solution	30.36	141	138.00	2.13
instance n=1000 454.alb	1	0	Solution	30.15	142	139.00	2.11
instance n=1000 455.alb	1	0	Solution	30.22	140	136.00	2.86
instance n=1000 456.alb	1	0	Solution	30.14	138	135.00	2.17
instance n=1000 457.alb	1	0	Solution	30.61	140	137.00	2.14
instance n=1000 458.alb	1	0	Solution	30.46	138	135.00	2.17
instance n=1000 459.alb	1	0	Solution	30.23	140	137.00	2.14
instance n=1000 46.alb	1	0	Solution	30.21	538	498.00	7.43
instance n=1000 460.alb	1	0	Solution	30.15	141	138.00	2.13
instance n=1000 461.alb	1	0	Solution	30.37	140	137.00	2.14
instance n=1000 462.alb	1	0	Solution	30.32	139	136.00	2.16
instance n=1000 463.alb	1	0	Solution	30.51	138	136.00	1.45
instance n=1000 464.alb	1	0	Solution	30.15	141	138.00	2.13
instance n=1000 465.alb	1	0	Solution	30.72	141	138.00	2.13
instance n=1000 466.alb	1	0	Solution	31.19	137	133.00	2.92
instance n=1000 467.alb	1	0	Solution	30.56	140	138.00	1.43
instance n=1000 468.alb	1	0	Solution	30.62	140	137.00	2.14
instance n=1000 469.alb	1	0	Solution	30.17	140	137.00	2.14
instance n=1000 47.alb	1	0	Solution	30.56	542	499.00	7.93
instance n=1000 470.alb	1	0	Solution	30.15	138	135.00	2.17
instance n=1000 471.alb	1	0	Solution	30.45	138	135.00	2.17
instance n=1000 472.alb	1	0	Solution	30.27	143	140.00	2.10
instance n=1000 473.alb	1	0	Solution	30.10	138	135.00	2.17
instance n=1000 474.alb	1	0	Solution	30.43	139	136.00	2.16
instance n=1000 475.alb	1	0	Solution	30.57	139	136.00	2.16
instance n=1000 476.alb	1	0	Solution	30.28	588	503.00	14.46
instance n=1000 477.alb	1	0	Solution	30.37	594	507.00	14.65
instance n=1000 478.alb	1	0	Solution	30.51	604	510.00	15.56
instance n=1000 479.alb	1	0	Solution	30.53	590	503.00	14.75

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 48.alb	1	0	Solution	30.25	565	508.00	10.09
instance n=1000 480.alb	1	0	Solution	30.29	578	498.00	13.84
instance n=1000 481.alb	1	0	Solution	30.60	585	504.00	13.85
instance n=1000 482.alb	1	0	Solution	30.39	605	505.00	16.53
instance n=1000 483.alb	1	0	Solution	30.52	577	499.00	13.52
instance n=1000 484.alb	1	0	Solution	30.48	596	508.00	14.77
instance n=1000 485.alb	1	0	Solution	30.43	591	505.00	14.55
instance n=1000 486.alb	1	0	Solution	30.51	583	500.00	14.24
instance n=1000 487.alb	1	0	Solution	30.32	592	502.00	15.20
instance n=1000 488.alb	1	0	Solution	30.85	581	502.00	13.60
instance n=1000 489.alb	1	0	Solution	30.27	577	498.00	13.69
instance n=1000 49.alb	1	0	Solution	30.44	544	500.00	8.09
instance n=1000 490.alb	1	0	Solution	30.21	587	501.00	14.65
instance n=1000 491.alb	1	0	Solution	30.32	582	500.00	14.09
instance n=1000 492.alb	1	0	Solution	30.24	596	509.00	14.60
instance n=1000 493.alb	1	0	Solution	30.51	568	495.00	12.85
instance n=1000 494.alb	1	0	Solution	30.26	580	500.00	13.79
instance n=1000 495.alb	1	0	Solution	30.28	603	507.00	15.92
instance n=1000 496.alb	1	0	Solution	30.63	571	495.00	13.31
instance n=1000 497.alb	1	0	Solution	30.33	578	499.00	13.67
instance n=1000 498.alb	1	0	Solution	30.22	594	506.00	14.81
instance n=1000 499.alb	1	0	Solution	30.21	580	499.00	13.97
instance n=1000 5.alb	1	0	Solution	30.27	136	135.00	0.74
instance n=1000 50.alb	1	0	Solution	30.23	528	493.00	6.63
instance n=1000 500.alb	1	0	Solution	30.20	586	503.00	14.16
instance n=1000 501.alb	1	0	Solution	30.17	237	227.00	4.22
instance n=1000 502.alb	1	0	Solution	30.23	232	224.00	3.45
instance n=1000 503.alb	1	0	Solution	30.61	233	224.00	3.86
instance n=1000 504.alb	1	0	Solution	30.25	236	227.00	3.81
instance n=1000 505.alb	1	0	Solution	30.51	222	213.00	4.05
instance n=1000 506.alb	1	0	Solution	30.49	230	223.00	3.04
instance n=1000 507.alb	1	0	Solution	30.45	230	220.00	4.35
instance n=1000 508.alb	1	0	Solution	30.18	227	219.00	3.52
instance n=1000 509.alb	1	0	Solution	30.56	233	225.00	3.43
instance n=1000 51.alb	1	0	Solution	30.14	231	226.00	2.16
instance n=1000 510.alb	1	0	Solution	30.18	235	226.00	3.83
instance n=1000 511.alb	1	0	Solution	30.21	238	230.00	3.36
instance n=1000 512.alb	1	0	Solution	30.42	227	219.00	3.52
instance n=1000 513.alb	1	0	Solution	30.13	228	219.00	3.95
instance n=1000 514.alb	1	0	Solution	30.12	234	226.00	3.42
instance n=1000 515.alb	1	0	Solution	30.21	229	221.00	3.49
instance n=1000 516.alb	1	0	Solution	30.22	238	229.00	3.78
instance n=1000 517.alb	1	0	Solution	30.32	229	221.00	3.49
instance n=1000 518.alb	1	0	Solution	30.11	229	220.00	3.93
instance n=1000 519.alb	1	0	Solution	30.13	229	221.00	3.49

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 52.alb	1	0	Solution	30.12	232	228.00	1.72
instance n=1000 520.alb	1	0	Solution	30.46	235	226.00	3.83
instance n=1000 521.alb	1	0	Solution	30.28	239	229.00	4.18
instance n=1000 522.alb	1	0	Solution	30.54	222	215.00	3.15
instance n=1000 523.alb	1	0	Solution	30.11	228	220.00	3.51
instance n=1000 524.alb	1	0	Solution	30.55	233	225.00	3.43
instance n=1000 525.alb	1	0	Solution	30.22	230	221.00	3.91
instance n=1000 53.alb	1	0	Solution	30.36	230	227.00	1.30
instance n=1000 54.alb	1	0	Solution	30.39	223	219.00	1.79
instance n=1000 55.alb	1	0	Solution	30.34	220	217.00	1.36
instance n=1000 56.alb	1	0	Solution	30.42	232	228.00	1.72
instance n=1000 57.alb	1	0	Solution	30.13	227	224.00	1.32
instance n=1000 58.alb	1	0	Solution	30.16	227	224.00	1.32
instance n=1000 59.alb	1	0	Solution	30.13	226	223.00	1.33
instance n=1000 6.alb	1	0	Solution	30.21	143	141.00	1.40
instance n=1000 60.alb	1	0	Solution	30.18	234	230.00	1.71
instance n=1000 61.alb	1	0	Solution	30.26	233	229.00	1.72
instance n=1000 62.alb	1	0	Solution	30.72	227	223.00	1.76
instance n=1000 63.alb	1	0	Solution	30.48	230	227.00	1.30
instance n=1000 64.alb	1	0	Solution	30.22	233	229.00	1.72
instance n=1000 65.alb	1	0	Solution	30.83	227	225.00	0.88
instance n=1000 66.alb	1	0	Solution	30.14	230	227.00	1.30
instance n=1000 67.alb	1	0	Solution	30.42	227	223.00	1.76
instance n=1000 68.alb	1	0	Solution	30.39	231	226.00	2.16
instance n=1000 69.alb	1	0	Solution	30.13	227	224.00	1.32
instance n=1000 7.alb	1	0	Solution	30.45	138	136.00	1.45
instance n=1000 70.alb	1	0	Solution	30.35	231	228.00	1.30
instance n=1000 71.alb	1	0	Solution	30.24	233	230.00	1.29
instance n=1000 72.alb	1	0	Solution	30.43	226	222.00	1.77
instance n=1000 73.alb	1	0	Solution	30.36	224	221.00	1.34
instance n=1000 74.alb	1	0	Solution	30.42	231	227.00	1.73
instance n=1000 75.alb	1	0	Solution	30.43	231	227.00	1.73
instance n=1000 76.alb	1	0	Solution	30.28	137	136.00	0.73
instance n=1000 77.alb	1	0	Solution	30.19	137	136.00	0.73
instance n=1000 78.alb	1	0	Solution	30.16	140	138.00	1.43
instance n=1000 79.alb	1	0	Solution	30.45	143	142.00	0.70
instance n=1000 8.alb	1	0	Solution	30.34	140	138.00	1.43
instance n=1000 80.alb	1	0	Solution	30.46	141	140.00	0.71
instance n=1000 81.alb	1	0	Solution	30.41	138	136.00	1.45
instance n=1000 82.alb	1	0	Solution	30.31	137	136.00	0.73
instance n=1000 83.alb	1	0	Solution	30.36	141	140.00	0.71
instance n=1000 84.alb	1	0	Solution	30.13	136	135.00	0.74
instance n=1000 85.alb	1	0	Solution	30.34	138	136.00	1.45
instance n=1000 86.alb	1	0	Solution	30.80	139	138.00	0.72
instance n=1000 87.alb	1	0	Solution	30.08	142	140.00	1.41

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 88.alb	1	0	Solution	30.32	142	140.00	1.41
instance n=1000 89.alb	1	0	Solution	30.46	142	140.00	1.41
instance n=1000 9.alb	1	0	Solution	30.45	136	134.00	1.47
instance n=1000 90.alb	1	0	Solution	30.61	139	138.00	0.72
instance n=1000 91.alb	1	0	Solution	30.35	142	141.00	0.70
instance n=1000 92.alb	1	0	Solution	30.40	137	136.00	0.73
instance n=1000 93.alb	1	0	Solution	30.09	138	137.00	0.72
instance n=1000 94.alb	1	0	Solution	30.11	139	137.00	1.44
instance n=1000 95.alb	1	0	Solution	30.20	137	136.00	0.73
instance n=1000 96.alb	1	0	Solution	30.39	139	137.00	1.44
instance n=1000 97.alb	1	0	Solution	30.18	140	138.00	1.43
instance n=1000 98.alb	1	0	Solution	30.37	137	136.00	0.73
instance n=1000 99.alb	1	0	Solution	30.57	137	136.00	0.73
instance n=100 1.alb	1	0	Solution	30.06	24	23.00	4.17
instance n=100 10.alb	1	0	Optimal	1.03	22	22.00	0.00
instance n=100 100.alb	1	0	Optimal	13.94	25	25.00	0.00
instance n=100 101.alb	1	0	Optimal	4.34	15	15.00	0.00
instance n=100 102.alb	1	0	Optimal	0.56	14	14.00	0.00
instance n=100 103.alb	1	0	Optimal	0.67	14	14.00	0.00
instance n=100 104.alb	1	0	Optimal	0.65	14	14.00	0.00
instance n=100 105.alb	1	0	Optimal	0.60	13	13.00	0.00
instance n=100 106.alb	1	0	Optimal	0.69	14	14.00	0.00
instance n=100 107.alb	1	0	Optimal	0.64	14	14.00	0.00
instance n=100 108.alb	1	0	Optimal	15.41	14	14.00	0.00
instance n=100 109.alb	1	0	Optimal	1.02	15	15.00	0.00
instance n=100 11.alb	1	0	Optimal	0.76	24	24.00	0.00
instance n=100 110.alb	1	0	Optimal	1.33	13	13.00	0.00
instance n=100 111.alb	1	0	Optimal	0.89	16	16.00	0.00
instance n=100 112.alb	1	0	Optimal	16.81	13	13.00	0.00
instance n=100 113.alb	1	0	Optimal	0.60	14	14.00	0.00
instance n=100 114.alb	1	0	Optimal	1.38	13	13.00	0.00
instance n=100 115.alb	1	0	Optimal	1.05	14	14.00	0.00
instance n=100 116.alb	1	0	Optimal	0.55	16	16.00	0.00
instance n=100 117.alb	1	0	Optimal	24.41	15	15.00	0.00
instance n=100 118.alb	1	0	Optimal	0.40	15	15.00	0.00
instance n=100 119.alb	1	0	Optimal	0.57	14	14.00	0.00
instance n=100 12.alb	1	0	Optimal	29.06	25	25.00	0.00
instance n=100 120.alb	1	0	Optimal	1.22	14	14.00	0.00
instance n=100 121.alb	1	0	Optimal	0.68	15	15.00	0.00
instance n=100 122.alb	1	0	Optimal	0.98	13	13.00	0.00
instance n=100 123.alb	1	0	Optimal	0.97	15	15.00	0.00
instance n=100 124.alb	1	0	Optimal	17.20	15	15.00	0.00
instance n=100 125.alb	1	0	Optimal	0.52	14	14.00	0.00
instance n=100 126.alb	1	0	Solution	30.11	53	49.00	7.55
instance n=100 127.alb	1	0	Solution	30.14	54	49.00	9.26

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 128.alb	1	0	Solution	30.08	58	52.00	10.34
instance n=100 129.alb	1	0	Solution	30.07	55	50.00	9.09
instance n=100 13.alb	1	0	Optimal	4.80	24	24.00	0.00
instance n=100 130.alb	1	0	Solution	30.07	56	51.00	8.93
instance n=100 131.alb	1	0	Solution	30.16	53	50.00	5.66
instance n=100 132.alb	1	0	Solution	30.10	59	52.00	11.86
instance n=100 133.alb	1	0	Solution	30.07	57	51.00	10.53
instance n=100 134.alb	1	0	Solution	30.10	57	51.00	10.53
instance n=100 135.alb	1	0	Solution	30.08	56	51.00	8.93
instance n=100 136.alb	1	0	Solution	30.14	53	49.00	7.55
instance n=100 137.alb	1	0	Solution	30.11	54	50.00	7.41
instance n=100 138.alb	1	0	Solution	30.10	57	52.00	8.77
instance n=100 139.alb	1	0	Solution	30.05	52	49.00	5.77
instance n=100 14.alb	1	0	Optimal	13.86	20	20.00	0.00
instance n=100 140.alb	1	0	Solution	30.05	55	51.00	7.27
instance n=100 141.alb	1	0	Solution	30.05	52	49.00	5.77
instance n=100 142.alb	1	0	Solution	30.13	56	50.00	10.71
instance n=100 143.alb	1	0	Solution	30.12	54	51.00	5.56
instance n=100 144.alb	1	0	Solution	30.11	49	47.00	4.08
instance n=100 145.alb	1	0	Solution	30.05	57	51.00	10.53
instance n=100 146.alb	1	0	Solution	30.12	53	50.00	5.66
instance n=100 147.alb	1	0	Solution	30.07	60	52.00	13.33
instance n=100 148.alb	1	0	Solution	30.11	53	50.00	5.66
instance n=100 149.alb	1	0	Solution	30.06	55	51.00	7.27
instance n=100 15.alb	1	0	Optimal	0.59	24	24.00	0.00
instance n=100 150.alb	1	0	Solution	30.03	58	51.00	12.07
instance n=100 151.alb	1	0	Solution	30.11	22	21.00	4.55
instance n=100 152.alb	1	0	Optimal	0.97	22	22.00	0.00
instance n=100 153.alb	1	0	Optimal	0.59	21	21.00	0.00
instance n=100 154.alb	1	0	Optimal	0.82	25	25.00	0.00
instance n=100 155.alb	1	0	Optimal	0.72	22	22.00	0.00
instance n=100 156.alb	1	0	Optimal	0.95	23	23.00	0.00
instance n=100 157.alb	1	0	Optimal	4.75	26	26.00	0.00
instance n=100 158.alb	1	0	Optimal	1.02	23	23.00	0.00
instance n=100 159.alb	1	0	Optimal	0.46	19	19.00	0.00
instance n=100 16.alb	1	0	Optimal	0.54	23	23.00	0.00
instance n=100 160.alb	1	0	Optimal	0.97	22	22.00	0.00
instance n=100 161.alb	1	0	Solution	30.06	23	22.00	4.35
instance n=100 162.alb	1	0	Solution	30.05	23	22.00	4.35
instance n=100 163.alb	1	0	Optimal	0.62	25	25.00	0.00
instance n=100 164.alb	1	0	Optimal	0.57	23	23.00	0.00
instance n=100 165.alb	1	0	Solution	30.04	25	24.00	4.00
instance n=100 166.alb	1	0	Optimal	7.70	24	24.00	0.00
instance n=100 167.alb	1	0	Optimal	0.96	22	22.00	0.00
instance n=100 168.alb	1	0	Solution	30.10	22	21.00	4.55

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 169.alb	1	0	Optimal	1.12	21	21.00	0.00
instance n=100 17.alb	1	0	Solution	30.08	22	21.00	4.55
instance n=100 170.alb	1	0	Optimal	15.42	24	24.00	0.00
instance n=100 171.alb	1	0	Solution	30.13	25	24.00	4.00
instance n=100 172.alb	1	0	Optimal	0.79	24	24.00	0.00
instance n=100 173.alb	1	0	Solution	30.07	25	24.00	4.00
instance n=100 174.alb	1	0	Optimal	15.49	22	22.00	0.00
instance n=100 175.alb	1	0	Solution	30.08	27	26.00	3.70
instance n=100 176.alb	1	0	Optimal	0.57	13	13.00	0.00
instance n=100 177.alb	1	0	Optimal	0.40	14	14.00	0.00
instance n=100 178.alb	1	0	Optimal	0.63	15	15.00	0.00
instance n=100 179.alb	1	0	Optimal	0.39	15	15.00	0.00
instance n=100 18.alb	1	0	Solution	30.10	20	19.00	5.00
instance n=100 180.alb	1	0	Optimal	0.64	15	15.00	0.00
instance n=100 181.alb	1	0	Optimal	0.51	13	13.00	0.00
instance n=100 182.alb	1	0	Optimal	0.61	15	15.00	0.00
instance n=100 183.alb	1	0	Optimal	0.61	14	14.00	0.00
instance n=100 184.alb	1	0	Optimal	0.80	14	14.00	0.00
instance n=100 185.alb	1	0	Optimal	0.89	15	15.00	0.00
instance n=100 186.alb	1	0	Optimal	6.82	14	14.00	0.00
instance n=100 187.alb	1	0	Solution	30.08	14	13.00	7.14
instance n=100 188.alb	1	0	Optimal	0.69	16	16.00	0.00
instance n=100 189.alb	1	0	Optimal	0.63	14	14.00	0.00
instance n=100 19.alb	1	0	Optimal	3.80	23	23.00	0.00
instance n=100 190.alb	1	0	Optimal	0.71	13	13.00	0.00
instance n=100 191.alb	1	0	Optimal	0.51	14	14.00	0.00
instance n=100 192.alb	1	0	Optimal	10.33	13	13.00	0.00
instance n=100 193.alb	1	0	Optimal	0.92	15	15.00	0.00
instance n=100 194.alb	1	0	Optimal	0.83	15	15.00	0.00
instance n=100 195.alb	1	0	Optimal	0.52	15	15.00	0.00
instance n=100 196.alb	1	0	Optimal	0.83	15	15.00	0.00
instance n=100 197.alb	1	0	Optimal	0.36	15	15.00	0.00
instance n=100 198.alb	1	0	Optimal	8.97	13	13.00	0.00
instance n=100 199.alb	1	0	Optimal	0.60	14	14.00	0.00
instance n=100 2.alb	1	0	Optimal	0.51	21	21.00	0.00
instance n=100 20.alb	1	0	Optimal	0.59	21	21.00	0.00
instance n=100 200.alb	1	0	Optimal	0.52	15	15.00	0.00
instance n=100 201.alb	1	0	Solution	30.04	55	51.00	7.27
instance n=100 202.alb	1	0	Solution	30.04	62	52.00	16.13
instance n=100 203.alb	1	0	Solution	30.11	53	49.00	7.55
instance n=100 204.alb	1	0	Solution	30.15	52	48.00	7.69
instance n=100 205.alb	1	0	Solution	30.10	58	51.00	12.07
instance n=100 206.alb	1	0	Solution	30.14	53	49.00	7.55
instance n=100 207.alb	1	0	Solution	30.10	52	49.00	5.77
instance n=100 208.alb	1	0	Solution	30.10	57	51.00	10.53

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 209.alb	1	0	Solution	30.09	56	51.00	8.93
instance n=100 21.alb	1	0	Optimal	4.37	21	21.00	0.00
instance n=100 210.alb	1	0	Solution	30.07	53	49.00	7.55
instance n=100 211.alb	1	0	Solution	30.10	53	49.00	7.55
instance n=100 212.alb	1	0	Solution	30.12	54	50.00	7.41
instance n=100 213.alb	1	0	Solution	30.08	54	50.00	7.41
instance n=100 214.alb	1	0	Solution	30.14	55	50.00	9.09
instance n=100 215.alb	1	0	Solution	30.12	51	47.00	7.84
instance n=100 216.alb	1	0	Solution	30.06	54	50.00	7.41
instance n=100 217.alb	1	0	Solution	30.08	53	49.00	7.55
instance n=100 218.alb	1	0	Solution	30.07	54	50.00	7.41
instance n=100 219.alb	1	0	Solution	30.10	53	49.00	7.55
instance n=100 22.alb	1	0	Solution	30.05	25	24.00	4.00
instance n=100 220.alb	1	0	Solution	30.16	54	50.00	7.41
instance n=100 221.alb	1	0	Solution	30.08	58	51.00	12.07
instance n=100 222.alb	1	0	Solution	30.14	54	50.00	7.41
instance n=100 223.alb	1	0	Solution	30.08	52	49.00	5.77
instance n=100 224.alb	1	0	Solution	30.14	56	51.00	8.93
instance n=100 225.alb	1	0	Solution	30.08	54	50.00	7.41
instance n=100 226.alb	1	0	Solution	30.05	25	24.00	4.00
instance n=100 227.alb	1	0	Solution	30.05	27	26.00	3.70
instance n=100 228.alb	1	0	Optimal	20.43	22	22.00	0.00
instance n=100 229.alb	1	0	Optimal	0.87	24	24.00	0.00
instance n=100 23.alb	1	0	Optimal	0.87	24	24.00	0.00
instance n=100 230.alb	1	0	Solution	30.10	24	23.00	4.17
instance n=100 231.alb	1	0	Solution	30.11	23	22.00	4.35
instance n=100 232.alb	1	0	Optimal	1.02	22	22.00	0.00
instance n=100 233.alb	1	0	Solution	30.13	23	22.00	4.35
instance n=100 234.alb	1	0	Optimal	0.63	23	23.00	0.00
instance n=100 235.alb	1	0	Optimal	6.48	26	26.00	0.00
instance n=100 236.alb	1	0	Solution	30.06	23	22.00	4.35
instance n=100 237.alb	1	0	Optimal	16.38	23	23.00	0.00
instance n=100 238.alb	1	0	Optimal	11.02	23	23.00	0.00
instance n=100 239.alb	1	0	Optimal	0.89	21	21.00	0.00
instance n=100 24.alb	1	0	Optimal	0.80	24	24.00	0.00
instance n=100 240.alb	1	0	Optimal	8.30	22	22.00	0.00
instance n=100 241.alb	1	0	Optimal	10.51	22	22.00	0.00
instance n=100 242.alb	1	0	Optimal	11.53	23	23.00	0.00
instance n=100 243.alb	1	0	Solution	30.12	24	23.00	4.17
instance n=100 244.alb	1	0	Optimal	0.81	21	21.00	0.00
instance n=100 245.alb	1	0	Solution	30.07	24	23.00	4.17
instance n=100 246.alb	1	0	Optimal	16.58	26	26.00	0.00
instance n=100 247.alb	1	0	Optimal	11.65	22	22.00	0.00
instance n=100 248.alb	1	0	Optimal	9.14	19	19.00	0.00
instance n=100 249.alb	1	0	Optimal	8.16	21	21.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 25.alb	1	0	Optimal	4.71	22	22.00	0.00
instance n=100 250.alb	1	0	Optimal	5.39	24	24.00	0.00
instance n=100 251.alb	1	0	Optimal	0.39	15	15.00	0.00
instance n=100 252.alb	1	0	Optimal	1.03	14	14.00	0.00
instance n=100 253.alb	1	0	Optimal	0.42	14	14.00	0.00
instance n=100 254.alb	1	0	Optimal	0.45	14	14.00	0.00
instance n=100 255.alb	1	0	Optimal	0.39	14	14.00	0.00
instance n=100 256.alb	1	0	Optimal	0.57	15	15.00	0.00
instance n=100 257.alb	1	0	Optimal	8.55	12	12.00	0.00
instance n=100 258.alb	1	0	Optimal	7.69	14	14.00	0.00
instance n=100 259.alb	1	0	Optimal	4.61	15	15.00	0.00
instance n=100 26.alb	1	0	Optimal	6.03	14	14.00	0.00
instance n=100 260.alb	1	0	Optimal	0.57	15	15.00	0.00
instance n=100 261.alb	1	0	Optimal	0.67	14	14.00	0.00
instance n=100 262.alb	1	0	Optimal	0.52	14	14.00	0.00
instance n=100 263.alb	1	0	Optimal	0.85	14	14.00	0.00
instance n=100 264.alb	1	0	Optimal	0.53	15	15.00	0.00
instance n=100 265.alb	1	0	Optimal	0.80	14	14.00	0.00
instance n=100 266.alb	1	0	Optimal	8.17	13	13.00	0.00
instance n=100 267.alb	1	0	Optimal	0.67	13	13.00	0.00
instance n=100 268.alb	1	0	Optimal	0.51	15	15.00	0.00
instance n=100 269.alb	1	0	Optimal	0.50	15	15.00	0.00
instance n=100 27.alb	1	0	Optimal	3.17	13	13.00	0.00
instance n=100 270.alb	1	0	Optimal	0.70	13	13.00	0.00
instance n=100 271.alb	1	0	Solution	30.06	14	13.00	7.14
instance n=100 272.alb	1	0	Optimal	0.45	14	14.00	0.00
instance n=100 273.alb	1	0	Optimal	18.30	13	13.00	0.00
instance n=100 274.alb	1	0	Optimal	8.78	13	13.00	0.00
instance n=100 275.alb	1	0	Optimal	0.69	13	13.00	0.00
instance n=100 276.alb	1	0	Solution	30.04	61	52.00	14.75
instance n=100 277.alb	1	0	Solution	30.11	58	51.00	12.07
instance n=100 278.alb	1	0	Solution	30.09	58	52.00	10.34
instance n=100 279.alb	1	0	Solution	30.10	55	50.00	9.09
instance n=100 28.alb	1	0	Optimal	4.73	14	14.00	0.00
instance n=100 280.alb	1	0	Solution	30.07	56	51.00	8.93
instance n=100 281.alb	1	0	Solution	30.10	62	52.00	16.13
instance n=100 282.alb	1	0	Solution	30.08	61	52.00	14.75
instance n=100 283.alb	1	0	Solution	30.11	56	50.00	10.71
instance n=100 284.alb	1	0	Solution	30.11	56	50.00	10.71
instance n=100 285.alb	1	0	Solution	30.08	55	50.00	9.09
instance n=100 286.alb	1	0	Solution	30.01	58	51.00	12.07
instance n=100 287.alb	1	0	Solution	30.11	55	50.00	9.09
instance n=100 288.alb	1	0	Solution	30.11	56	51.00	8.93
instance n=100 289.alb	1	0	Solution	30.10	62	52.00	16.13
instance n=100 29.alb	1	0	Optimal	3.16	14	14.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 290.alb	1	0	Solution	30.07	55	50.00	9.09
instance n=100 291.alb	1	0	Solution	30.06	53	49.00	7.55
instance n=100 292.alb	1	0	Solution	30.09	59	51.00	13.56
instance n=100 293.alb	1	0	Solution	30.10	53	49.00	7.55
instance n=100 294.alb	1	0	Solution	30.10	58	52.00	10.34
instance n=100 295.alb	1	0	Solution	30.09	57	51.00	10.53
instance n=100 296.alb	1	0	Solution	30.06	56	50.00	10.71
instance n=100 297.alb	1	0	Solution	30.11	59	51.00	13.56
instance n=100 298.alb	1	0	Solution	30.10	59	52.00	11.86
instance n=100 299.alb	1	0	Solution	30.09	56	50.00	10.71
instance n=100 3.alb	1	0	Optimal	1.01	20	20.00	0.00
instance n=100 30.alb	1	0	Optimal	0.39	15	15.00	0.00
instance n=100 300.alb	1	0	Solution	30.07	55	49.00	10.91
instance n=100 301.alb	1	0	Optimal	0.76	23	23.00	0.00
instance n=100 302.alb	1	0	Optimal	0.64	24	24.00	0.00
instance n=100 303.alb	1	0	Optimal	10.30	24	24.00	0.00
instance n=100 304.alb	1	0	Optimal	3.36	21	21.00	0.00
instance n=100 305.alb	1	0	Optimal	0.52	22	22.00	0.00
instance n=100 306.alb	1	0	Optimal	0.69	24	24.00	0.00
instance n=100 307.alb	1	0	Solution	30.06	24	23.00	4.17
instance n=100 308.alb	1	0	Solution	30.11	21	20.00	4.76
instance n=100 309.alb	1	0	Solution	30.12	22	21.00	4.55
instance n=100 31.alb	1	0	Optimal	0.73	14	14.00	0.00
instance n=100 310.alb	1	0	Optimal	4.85	23	23.00	0.00
instance n=100 311.alb	1	0	Optimal	0.58	21	21.00	0.00
instance n=100 312.alb	1	0	Optimal	0.67	22	22.00	0.00
instance n=100 313.alb	1	0	Optimal	0.98	23	23.00	0.00
instance n=100 314.alb	1	0	Optimal	1.00	19	19.00	0.00
instance n=100 315.alb	1	0	Solution	30.06	23	22.00	4.35
instance n=100 316.alb	1	0	Optimal	0.61	24	24.00	0.00
instance n=100 317.alb	1	0	Optimal	0.63	26	26.00	0.00
instance n=100 318.alb	1	0	Optimal	0.68	21	21.00	0.00
instance n=100 319.alb	1	0	Optimal	5.12	23	23.00	0.00
instance n=100 32.alb	1	0	Optimal	0.62	14	14.00	0.00
instance n=100 320.alb	1	0	Optimal	0.45	22	22.00	0.00
instance n=100 321.alb	1	0	Optimal	0.77	26	26.00	0.00
instance n=100 322.alb	1	0	Solution	30.05	24	23.00	4.17
instance n=100 323.alb	1	0	Optimal	0.53	24	24.00	0.00
instance n=100 324.alb	1	0	Optimal	0.76	23	23.00	0.00
instance n=100 325.alb	1	0	Solution	30.05	26	25.00	3.85
instance n=100 326.alb	1	0	Optimal	0.38	13	13.00	0.00
instance n=100 327.alb	1	0	Optimal	0.96	14	14.00	0.00
instance n=100 328.alb	1	0	Solution	30.08	15	14.00	6.67
instance n=100 329.alb	1	0	Optimal	0.61	14	14.00	0.00
instance n=100 33.alb	1	0	Optimal	1.88	15	15.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 330.alb	1	0	Optimal	20.57	14	14.00	0.00
instance n=100 331.alb	1	0	Optimal	0.38	14	14.00	0.00
instance n=100 332.alb	1	0	Optimal	0.48	14	14.00	0.00
instance n=100 333.alb	1	0	Optimal	0.53	15	15.00	0.00
instance n=100 334.alb	1	0	Optimal	5.87	14	14.00	0.00
instance n=100 335.alb	1	0	Optimal	0.41	13	13.00	0.00
instance n=100 336.alb	1	0	Optimal	0.64	15	15.00	0.00
instance n=100 337.alb	1	0	Optimal	1.12	13	13.00	0.00
instance n=100 338.alb	1	0	Solution	30.09	15	14.00	6.67
instance n=100 339.alb	1	0	Optimal	0.41	14	14.00	0.00
instance n=100 34.alb	1	0	Optimal	0.91	15	15.00	0.00
instance n=100 340.alb	1	0	Optimal	0.57	14	14.00	0.00
instance n=100 341.alb	1	0	Optimal	0.73	16	16.00	0.00
instance n=100 342.alb	1	0	Optimal	3.69	14	14.00	0.00
instance n=100 343.alb	1	0	Optimal	0.87	16	16.00	0.00
instance n=100 344.alb	1	0	Optimal	0.51	15	15.00	0.00
instance n=100 345.alb	1	0	Optimal	0.41	14	14.00	0.00
instance n=100 346.alb	1	0	Optimal	0.51	14	14.00	0.00
instance n=100 347.alb	1	0	Optimal	0.58	14	14.00	0.00
instance n=100 348.alb	1	0	Optimal	0.50	14	14.00	0.00
instance n=100 349.alb	1	0	Optimal	0.52	13	13.00	0.00
instance n=100 35.alb	1	0	Optimal	0.63	15	15.00	0.00
instance n=100 350.alb	1	0	Optimal	0.62	14	14.00	0.00
instance n=100 351.alb	1	0	Solution	30.12	60	52.00	13.33
instance n=100 352.alb	1	0	Solution	30.13	63	52.00	17.46
instance n=100 353.alb	1	0	Solution	30.06	53	49.00	7.55
instance n=100 354.alb	1	0	Solution	30.13	53	49.00	7.55
instance n=100 355.alb	1	0	Solution	30.11	56	51.00	8.93
instance n=100 356.alb	1	0	Solution	30.06	61	53.00	13.11
instance n=100 357.alb	1	0	Solution	30.11	54	50.00	7.41
instance n=100 358.alb	1	0	Solution	30.09	53	50.00	5.66
instance n=100 359.alb	1	0	Solution	30.13	54	50.00	7.41
instance n=100 36.alb	1	0	Optimal	19.30	14	14.00	0.00
instance n=100 360.alb	1	0	Solution	30.05	56	51.00	8.93
instance n=100 361.alb	1	0	Solution	30.10	53	49.00	7.55
instance n=100 362.alb	1	0	Solution	30.17	57	51.00	10.53
instance n=100 363.alb	1	0	Solution	30.13	54	50.00	7.41
instance n=100 364.alb	1	0	Solution	30.09	53	50.00	5.66
instance n=100 365.alb	1	0	Solution	30.15	55	50.00	9.09
instance n=100 366.alb	1	0	Solution	30.08	62	53.00	14.52
instance n=100 367.alb	1	0	Solution	30.09	57	51.00	10.53
instance n=100 368.alb	1	0	Solution	30.09	60	52.00	13.33
instance n=100 369.alb	1	0	Solution	30.11	52	49.00	5.77
instance n=100 37.alb	1	0	Optimal	0.91	14	14.00	0.00
instance n=100 370.alb	1	0	Solution	30.15	57	52.00	8.77

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 371.alb	1	0	Solution	30.07	53	50.00	5.66
instance n=100 372.alb	1	0	Solution	30.13	49	47.00	4.08
instance n=100 373.alb	1	0	Solution	30.07	52	49.00	5.77
instance n=100 374.alb	1	0	Solution	30.08	53	50.00	5.66
instance n=100 375.alb	1	0	Solution	30.15	58	52.00	10.34
instance n=100 376.alb	1	0	Optimal	0.84	23	23.00	0.00
instance n=100 377.alb	1	0	Solution	30.11	21	20.00	4.76
instance n=100 378.alb	1	0	Optimal	7.91	22	22.00	0.00
instance n=100 379.alb	1	0	Solution	30.05	24	23.00	4.17
instance n=100 38.alb	1	0	Optimal	1.10	14	14.00	0.00
instance n=100 380.alb	1	0	Solution	30.11	23	22.00	4.35
instance n=100 381.alb	1	0	Optimal	3.64	24	24.00	0.00
instance n=100 382.alb	1	0	Optimal	11.32	25	25.00	0.00
instance n=100 383.alb	1	0	Optimal	0.93	25	25.00	0.00
instance n=100 384.alb	1	0	Optimal	1.88	25	25.00	0.00
instance n=100 385.alb	1	0	Optimal	0.57	22	22.00	0.00
instance n=100 386.alb	1	0	Solution	30.05	24	23.00	4.17
instance n=100 387.alb	1	0	Optimal	1.40	22	22.00	0.00
instance n=100 388.alb	1	0	Solution	30.07	26	25.00	3.85
instance n=100 389.alb	1	0	Optimal	0.48	23	23.00	0.00
instance n=100 39.alb	1	0	Optimal	0.52	14	14.00	0.00
instance n=100 390.alb	1	0	Solution	30.09	23	22.00	4.35
instance n=100 391.alb	1	0	Optimal	0.55	20	20.00	0.00
instance n=100 392.alb	1	0	Optimal	0.57	22	22.00	0.00
instance n=100 393.alb	1	0	Solution	30.06	24	23.00	4.17
instance n=100 394.alb	1	0	Optimal	1.00	22	22.00	0.00
instance n=100 395.alb	1	0	Optimal	16.45	24	24.00	0.00
instance n=100 396.alb	1	0	Optimal	17.84	20	20.00	0.00
instance n=100 397.alb	1	0	Solution	30.09	26	25.00	3.85
instance n=100 398.alb	1	0	Solution	30.09	25	24.00	4.00
instance n=100 399.alb	1	0	Optimal	1.36	23	23.00	0.00
instance n=100 4.alb	1	0	Optimal	0.92	24	24.00	0.00
instance n=100 40.alb	1	0	Optimal	1.21	14	14.00	0.00
instance n=100 400.alb	1	0	Optimal	7.31	24	24.00	0.00
instance n=100 401.alb	1	0	Optimal	0.53	15	15.00	0.00
instance n=100 402.alb	1	0	Optimal	0.55	15	15.00	0.00
instance n=100 403.alb	1	0	Optimal	0.73	14	14.00	0.00
instance n=100 404.alb	1	0	Optimal	0.78	15	15.00	0.00
instance n=100 405.alb	1	0	Optimal	0.52	13	13.00	0.00
instance n=100 406.alb	1	0	Optimal	0.69	14	14.00	0.00
instance n=100 407.alb	1	0	Optimal	0.97	15	15.00	0.00
instance n=100 408.alb	1	0	Optimal	0.86	14	14.00	0.00
instance n=100 409.alb	1	0	Optimal	0.43	15	15.00	0.00
instance n=100 41.alb	1	0	Optimal	1.09	13	13.00	0.00
instance n=100 410.alb	1	0	Optimal	0.40	14	14.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 411.alb	1	0	Optimal	6.00	14	14.00	0.00
instance n=100 412.alb	1	0	Optimal	0.61	14	14.00	0.00
instance n=100 413.alb	1	0	Optimal	0.84	14	14.00	0.00
instance n=100 414.alb	1	0	Solution	30.12	15	14.00	6.67
instance n=100 415.alb	1	0	Optimal	6.42	13	13.00	0.00
instance n=100 416.alb	1	0	Optimal	0.61	14	14.00	0.00
instance n=100 417.alb	1	0	Optimal	0.62	15	15.00	0.00
instance n=100 418.alb	1	0	Optimal	0.75	16	16.00	0.00
instance n=100 419.alb	1	0	Optimal	6.36	14	14.00	0.00
instance n=100 42.alb	1	0	Optimal	0.46	14	14.00	0.00
instance n=100 420.alb	1	0	Optimal	0.43	14	14.00	0.00
instance n=100 421.alb	1	0	Optimal	0.38	14	14.00	0.00
instance n=100 422.alb	1	0	Optimal	0.58	15	15.00	0.00
instance n=100 423.alb	1	0	Optimal	5.44	14	14.00	0.00
instance n=100 424.alb	1	0	Optimal	0.51	14	14.00	0.00
instance n=100 425.alb	1	0	Optimal	0.59	15	15.00	0.00
instance n=100 426.alb	1	0	Solution	30.10	61	53.00	13.11
instance n=100 427.alb	1	0	Solution	30.08	56	50.00	10.71
instance n=100 428.alb	1	0	Solution	30.16	55	50.00	9.09
instance n=100 429.alb	1	0	Solution	30.08	59	52.00	11.86
instance n=100 43.alb	1	0	Optimal	7.35	14	14.00	0.00
instance n=100 430.alb	1	0	Solution	30.05	55	50.00	9.09
instance n=100 431.alb	1	0	Solution	30.08	54	50.00	7.41
instance n=100 432.alb	1	0	Solution	30.11	56	51.00	8.93
instance n=100 433.alb	1	0	Solution	30.09	54	49.00	9.26
instance n=100 434.alb	1	0	Solution	30.08	57	51.00	10.53
instance n=100 435.alb	1	0	Solution	30.09	57	50.00	12.28
instance n=100 436.alb	1	0	Solution	30.10	52	48.00	7.69
instance n=100 437.alb	1	0	Solution	30.08	54	50.00	7.41
instance n=100 438.alb	1	0	Solution	30.10	56	51.00	8.93
instance n=100 439.alb	1	0	Solution	30.11	56	51.00	8.93
instance n=100 44.alb	1	0	Optimal	0.52	14	14.00	0.00
instance n=100 440.alb	1	0	Solution	30.10	54	49.00	9.26
instance n=100 441.alb	1	0	Solution	30.07	53	50.00	5.66
instance n=100 442.alb	1	0	Solution	30.10	53	48.00	9.43
instance n=100 443.alb	1	0	Solution	30.08	56	50.00	10.71
instance n=100 444.alb	1	0	Solution	30.08	54	50.00	7.41
instance n=100 445.alb	1	0	Solution	30.09	56	51.00	8.93
instance n=100 446.alb	1	0	Solution	30.07	58	52.00	10.34
instance n=100 447.alb	1	0	Solution	30.13	55	50.00	9.09
instance n=100 448.alb	1	0	Solution	30.09	56	51.00	8.93
instance n=100 449.alb	1	0	Solution	30.02	56	50.00	10.71
instance n=100 45.alb	1	0	Optimal	0.37	14	14.00	0.00
instance n=100 450.alb	1	0	Solution	30.04	55	50.00	9.09
instance n=100 451.alb	1	0	Optimal	6.00	26	26.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 452.alb	1	0	Optimal	4.68	22	22.00	0.00
instance n=100 453.alb	1	0	Optimal	3.91	24	24.00	0.00
instance n=100 454.alb	1	0	Optimal	2.59	23	23.00	0.00
instance n=100 455.alb	1	0	Optimal	5.54	23	23.00	0.00
instance n=100 456.alb	1	0	Optimal	5.37	26	26.00	0.00
instance n=100 457.alb	1	0	Optimal	3.62	23	23.00	0.00
instance n=100 458.alb	1	0	Optimal	3.43	24	24.00	0.00
instance n=100 459.alb	1	0	Optimal	4.82	23	23.00	0.00
instance n=100 46.alb	1	0	Optimal	0.53	14	14.00	0.00
instance n=100 460.alb	1	0	Optimal	8.66	23	23.00	0.00
instance n=100 461.alb	1	0	Optimal	4.16	23	23.00	0.00
instance n=100 462.alb	1	0	Optimal	6.39	23	23.00	0.00
instance n=100 463.alb	1	0	Optimal	2.11	26	26.00	0.00
instance n=100 464.alb	1	0	Optimal	6.64	25	25.00	0.00
instance n=100 465.alb	1	0	Optimal	5.46	22	22.00	0.00
instance n=100 466.alb	1	0	Optimal	4.48	26	25.00	3.85
instance n=100 467.alb	1	0	Optimal	9.65	21	21.00	0.00
instance n=100 468.alb	1	0	Optimal	12.82	25	25.00	0.00
instance n=100 469.alb	1	0	Optimal	2.14	22	22.00	0.00
instance n=100 47.alb	1	0	Optimal	0.75	14	14.00	0.00
instance n=100 470.alb	1	0	Solution	30.14	26	25.00	3.85
instance n=100 471.alb	1	0	Optimal	9.86	26	26.00	0.00
instance n=100 472.alb	1	0	Optimal	0.96	23	23.00	0.00
instance n=100 473.alb	1	0	Optimal	3.97	28	28.00	0.00
instance n=100 474.alb	1	0	Optimal	2.22	23	23.00	0.00
instance n=100 475.alb	1	0	Solution	30.08	24	23.00	4.17
instance n=100 476.alb	1	0	Optimal	0.51	14	14.00	0.00
instance n=100 477.alb	1	0	Optimal	0.60	14	14.00	0.00
instance n=100 478.alb	1	0	Optimal	0.88	14	14.00	0.00
instance n=100 479.alb	1	0	Optimal	1.24	16	16.00	0.00
instance n=100 48.alb	1	0	Optimal	0.99	15	15.00	0.00
instance n=100 480.alb	1	0	Optimal	1.44	15	15.00	0.00
instance n=100 481.alb	1	0	Optimal	2.38	15	15.00	0.00
instance n=100 482.alb	1	0	Optimal	3.00	15	15.00	0.00
instance n=100 483.alb	1	0	Optimal	1.67	14	14.00	0.00
instance n=100 484.alb	1	0	Optimal	0.62	14	14.00	0.00
instance n=100 485.alb	1	0	Optimal	2.32	16	16.00	0.00
instance n=100 486.alb	1	0	Optimal	0.93	15	15.00	0.00
instance n=100 487.alb	1	0	Optimal	2.43	15	15.00	0.00
instance n=100 488.alb	1	0	Optimal	1.30	16	16.00	0.00
instance n=100 489.alb	1	0	Optimal	4.18	13	13.00	0.00
instance n=100 49.alb	1	0	Optimal	0.73	14	14.00	0.00
instance n=100 490.alb	1	0	Optimal	1.28	15	15.00	0.00
instance n=100 491.alb	1	0	Optimal	1.69	16	16.00	0.00
instance n=100 492.alb	1	0	Optimal	3.23	14	14.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 493.alb	1	0	Optimal	1.92	14	14.00	0.00
instance n=100 494.alb	1	0	Optimal	0.77	14	14.00	0.00
instance n=100 495.alb	1	0	Optimal	1.87	15	15.00	0.00
instance n=100 496.alb	1	0	Optimal	1.21	14	14.00	0.00
instance n=100 497.alb	1	0	Optimal	0.56	13	13.00	0.00
instance n=100 498.alb	1	0	Optimal	1.12	14	14.00	0.00
instance n=100 499.alb	1	0	Optimal	1.46	14	14.00	0.00
instance n=100 5.alb	1	0	Optimal	1.08	22	22.00	0.00
instance n=100 50.alb	1	0	Optimal	0.63	14	14.00	0.00
instance n=100 500.alb	1	0	Optimal	0.72	14	14.00	0.00
instance n=100 501.alb	1	0	Solution	30.10	63	58.00	7.94
instance n=100 502.alb	1	0	Solution	30.05	64	59.00	7.81
instance n=100 503.alb	1	0	Solution	30.08	60	55.00	8.33
instance n=100 504.alb	1	0	Solution	30.12	60	57.00	5.00
instance n=100 505.alb	1	0	Solution	30.05	61	52.00	14.75
instance n=100 506.alb	1	0	Solution	30.06	59	53.00	10.17
instance n=100 507.alb	1	0	Solution	30.09	59	55.00	6.78
instance n=100 508.alb	1	0	Solution	30.12	56	55.00	1.79
instance n=100 509.alb	1	0	Solution	30.10	57	54.00	5.26
instance n=100 51.alb	1	0	Solution	30.11	51	48.00	5.88
instance n=100 510.alb	1	0	Solution	30.11	58	54.00	6.90
instance n=100 511.alb	1	0	Solution	30.10	60	55.00	8.33
instance n=100 512.alb	1	0	Solution	30.08	60	54.00	10.00
instance n=100 513.alb	1	0	Solution	30.09	62	54.00	12.90
instance n=100 514.alb	1	0	Solution	30.09	58	53.00	8.62
instance n=100 515.alb	1	0	Solution	30.05	61	55.00	9.84
instance n=100 516.alb	1	0	Solution	30.03	70	59.00	15.71
instance n=100 517.alb	1	0	Solution	30.10	62	56.00	9.68
instance n=100 518.alb	1	0	Solution	30.09	57	52.00	8.77
instance n=100 519.alb	1	0	Solution	30.05	61	56.00	8.20
instance n=100 52.alb	1	0	Solution	30.05	53	50.00	5.66
instance n=100 520.alb	1	0	Solution	30.11	60	56.00	6.67
instance n=100 521.alb	1	0	Solution	30.12	70	61.00	12.86
instance n=100 522.alb	1	0	Solution	30.10	59	53.00	10.17
instance n=100 523.alb	1	0	Solution	30.11	55	53.00	3.64
instance n=100 524.alb	1	0	Solution	30.07	59	53.00	10.17
instance n=100 525.alb	1	0	Solution	30.10	62	54.00	12.90
instance n=100 53.alb	1	0	Solution	30.06	53	50.00	5.66
instance n=100 54.alb	1	0	Solution	30.06	52	49.00	5.77
instance n=100 55.alb	1	0	Solution	30.12	54	50.00	7.41
instance n=100 56.alb	1	0	Solution	30.07	53	50.00	5.66
instance n=100 57.alb	1	0	Solution	30.05	55	51.00	7.27
instance n=100 58.alb	1	0	Solution	30.13	58	52.00	10.34
instance n=100 59.alb	1	0	Solution	30.09	58	51.00	12.07
instance n=100 6.alb	1	0	Optimal	3.68	22	22.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 60.alb	1	0	Solution	30.11	54	51.00	5.56
instance n=100 61.alb	1	0	Solution	30.10	56	51.00	8.93
instance n=100 62.alb	1	0	Solution	30.13	53	49.00	7.55
instance n=100 63.alb	1	0	Solution	30.07	61	52.00	14.75
instance n=100 64.alb	1	0	Solution	30.11	57	51.00	10.53
instance n=100 65.alb	1	0	Solution	30.06	62	53.00	14.52
instance n=100 66.alb	1	0	Solution	30.08	52	49.00	5.77
instance n=100 67.alb	1	0	Solution	30.13	56	51.00	8.93
instance n=100 68.alb	1	0	Solution	30.06	57	49.00	14.04
instance n=100 69.alb	1	0	Solution	30.05	54	51.00	5.56
instance n=100 7.alb	1	0	Optimal	0.54	26	26.00	0.00
instance n=100 70.alb	1	0	Solution	30.08	55	50.00	9.09
instance n=100 71.alb	1	0	Solution	30.12	54	50.00	7.41
instance n=100 72.alb	1	0	Solution	30.08	55	50.00	9.09
instance n=100 73.alb	1	0	Solution	30.10	56	52.00	7.14
instance n=100 74.alb	1	0	Solution	30.11	53	49.00	7.55
instance n=100 75.alb	1	0	Solution	30.06	56	51.00	8.93
instance n=100 76.alb	1	0	Optimal	0.98	23	23.00	0.00
instance n=100 77.alb	1	0	Optimal	0.61	20	20.00	0.00
instance n=100 78.alb	1	0	Optimal	20.10	21	21.00	0.00
instance n=100 79.alb	1	0	Optimal	0.81	21	21.00	0.00
instance n=100 8.alb	1	0	Optimal	0.92	24	24.00	0.00
instance n=100 80.alb	1	0	Optimal	11.62	22	22.00	0.00
instance n=100 81.alb	1	0	Optimal	16.85	20	20.00	0.00
instance n=100 82.alb	1	0	Optimal	5.11	21	21.00	0.00
instance n=100 83.alb	1	0	Optimal	0.56	22	22.00	0.00
instance n=100 84.alb	1	0	Solution	30.06	27	26.00	3.70
instance n=100 85.alb	1	0	Solution	30.06	25	24.00	4.00
instance n=100 86.alb	1	0	Optimal	2.08	23	23.00	0.00
instance n=100 87.alb	1	0	Optimal	0.54	22	22.00	0.00
instance n=100 88.alb	1	0	Solution	30.11	24	23.00	4.17
instance n=100 89.alb	1	0	Optimal	6.82	24	24.00	0.00
instance n=100 9.alb	1	0	Solution	30.11	24	23.00	4.17
instance n=100 90.alb	1	0	Solution	30.11	21	20.00	4.76
instance n=100 91.alb	1	0	Optimal	0.85	25	25.00	0.00
instance n=100 92.alb	1	0	Optimal	0.64	24	24.00	0.00
instance n=100 93.alb	1	0	Optimal	28.85	27	27.00	0.00
instance n=100 94.alb	1	0	Optimal	24.95	22	22.00	0.00
instance n=100 95.alb	1	0	Optimal	6.49	21	21.00	0.00
instance n=100 96.alb	1	0	Optimal	7.38	21	21.00	0.00
instance n=100 97.alb	1	0	Optimal	5.11	22	22.00	0.00
instance n=100 98.alb	1	0	Optimal	1.71	22	22.00	0.00
instance n=100 99.alb	1	0	Optimal	0.72	22	22.00	0.00
instance n=20 1.alb	1	0	Optimal	0.14	3	3.00	0.00
instance n=20 10.alb	1	0	Optimal	0.03	3	3.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 100.alb	1	0	Optimal	0.22	11	11.00	0.00
instance n=20 101.alb	1	0	Optimal	1.99	13	13.00	0.00
instance n=20 102.alb	1	0	Optimal	0.33	13	13.00	0.00
instance n=20 103.alb	1	0	Optimal	0.10	12	12.00	0.00
instance n=20 104.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 105.alb	1	0	Optimal	0.10	12	12.00	0.00
instance n=20 106.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 107.alb	1	0	Optimal	0.96	14	14.00	0.00
instance n=20 108.alb	1	0	Optimal	1.37	15	15.00	0.00
instance n=20 109.alb	1	0	Optimal	0.24	12	12.00	0.00
instance n=20 11.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 110.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 111.alb	1	0	Optimal	0.26	13	13.00	0.00
instance n=20 112.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 113.alb	1	0	Optimal	0.25	12	12.00	0.00
instance n=20 114.alb	1	0	Optimal	0.34	13	13.00	0.00
instance n=20 115.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 116.alb	1	0	Optimal	0.04	5	5.00	0.00
instance n=20 117.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 118.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 119.alb	1	0	Optimal	0.06	6	6.00	0.00
instance n=20 12.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 120.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 121.alb	1	0	Optimal	0.05	5	5.00	0.00
instance n=20 122.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 123.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 124.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 125.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 126.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 127.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 128.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 129.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 13.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 130.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 131.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=20 132.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 133.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 134.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 135.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 136.alb	1	0	Optimal	0.11	6	6.00	0.00
instance n=20 137.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 138.alb	1	0	Optimal	0.05	5	5.00	0.00
instance n=20 139.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 14.alb	1	0	Optimal	0.05	3	3.00	0.00
instance n=20 140.alb	1	0	Optimal	0.03	5	5.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 141.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 142.alb	1	0	Optimal	0.04	3	3.00	0.00
instance n=20 143.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 144.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 145.alb	1	0	Optimal	0.04	3	3.00	0.00
instance n=20 146.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 147.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 148.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 149.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 15.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 150.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 151.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 152.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 153.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 154.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 155.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 156.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 157.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 158.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 159.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 16.alb	1	0	Optimal	0.33	12	12.00	0.00
instance n=20 160.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 161.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 162.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 163.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 164.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 165.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 166.alb	1	0	Optimal	1.90	12	12.00	0.00
instance n=20 167.alb	1	0	Optimal	0.70	11	11.00	0.00
instance n=20 168.alb	1	0	Optimal	0.09	10	10.00	0.00
instance n=20 169.alb	1	0	Optimal	0.27	11	11.00	0.00
instance n=20 17.alb	1	0	Optimal	0.05	10	10.00	0.00
instance n=20 170.alb	1	0	Optimal	0.08	11	11.00	0.00
instance n=20 171.alb	1	0	Optimal	21.85	13	13.00	0.00
instance n=20 172.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 173.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 174.alb	1	0	Optimal	0.38	12	12.00	0.00
instance n=20 175.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 176.alb	1	0	Optimal	0.44	11	11.00	0.00
instance n=20 177.alb	1	0	Optimal	0.71	10	10.00	0.00
instance n=20 178.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 179.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=20 18.alb	1	0	Optimal	0.33	11	11.00	0.00
instance n=20 180.alb	1	0	Optimal	5.92	13	13.00	0.00
instance n=20 181.alb	1	0	Optimal	0.10	11	11.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 182.alb	1	0	Optimal	0.96	11	11.00	0.00
instance n=20 183.alb	1	0	Optimal	4.86	13	13.00	0.00
instance n=20 184.alb	1	0	Optimal	0.80	12	12.00	0.00
instance n=20 185.alb	1	0	Optimal	7.53	15	15.00	0.00
instance n=20 186.alb	1	0	Optimal	5.00	14	14.00	0.00
instance n=20 187.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 188.alb	1	0	Optimal	0.17	11	11.00	0.00
instance n=20 189.alb	1	0	Optimal	1.08	13	13.00	0.00
instance n=20 19.alb	1	0	Optimal	3.41	14	14.00	0.00
instance n=20 190.alb	1	0	Optimal	22.71	15	15.00	0.00
instance n=20 191.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 192.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 193.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 194.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 195.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 196.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 197.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 198.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 199.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 2.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 20.alb	1	0	Optimal	0.25	11	11.00	0.00
instance n=20 200.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 201.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 202.alb	1	0	Optimal	0.11	4	4.00	0.00
instance n=20 203.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 204.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 205.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 206.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 207.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 208.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 209.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 21.alb	1	0	Optimal	1.57	14	14.00	0.00
instance n=20 210.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 211.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 212.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 213.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 214.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 215.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 216.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 217.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 218.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 219.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 22.alb	1	0	Optimal	0.52	12	12.00	0.00
instance n=20 220.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 221.alb	1	0	Optimal	0.02	3	3.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 222.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 223.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 224.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 225.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 226.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 227.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 228.alb	1	0	Optimal	0.02	2	2.00	0.00
instance n=20 229.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 23.alb	1	0	Optimal	11.89	13	13.00	0.00
instance n=20 230.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 231.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 232.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 233.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 234.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 235.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 236.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 237.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 238.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 239.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 24.alb	1	0	Optimal	0.10	11	11.00	0.00
instance n=20 240.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 241.alb	1	0	Optimal	0.19	13	13.00	0.00
instance n=20 242.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 243.alb	1	0	Optimal	0.10	10	10.00	0.00
instance n=20 244.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 245.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=20 246.alb	1	0	Optimal	0.27	13	13.00	0.00
instance n=20 247.alb	1	0	Optimal	0.12	11	11.00	0.00
instance n=20 248.alb	1	0	Optimal	0.10	11	11.00	0.00
instance n=20 249.alb	1	0	Optimal	0.29	13	13.00	0.00
instance n=20 25.alb	1	0	Optimal	0.19	11	11.00	0.00
instance n=20 250.alb	1	0	Optimal	0.05	10	10.00	0.00
instance n=20 251.alb	1	0	Optimal	0.10	12	12.00	0.00
instance n=20 252.alb	1	0	Optimal	0.18	11	11.00	0.00
instance n=20 253.alb	1	0	Optimal	0.25	13	13.00	0.00
instance n=20 254.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 255.alb	1	0	Optimal	0.41	13	13.00	0.00
instance n=20 256.alb	1	0	Optimal	0.16	14	14.00	0.00
instance n=20 257.alb	1	0	Optimal	0.02	10	10.00	0.00
instance n=20 258.alb	1	0	Optimal	0.17	13	13.00	0.00
instance n=20 259.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=20 26.alb	1	0	Optimal	0.94	12	12.00	0.00
instance n=20 260.alb	1	0	Optimal	0.36	12	12.00	0.00
instance n=20 261.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=20 262.alb	1	0	Optimal	0.09	11	11.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 263.alb	1	0	Optimal	0.17	12	12.00	0.00
instance n=20 264.alb	1	0	Optimal	0.17	12	12.00	0.00
instance n=20 265.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 266.alb	1	0	Optimal	0.11	5	5.00	0.00
instance n=20 267.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 268.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 269.alb	1	0	Optimal	0.10	7	7.00	0.00
instance n=20 27.alb	1	0	Optimal	2.72	13	13.00	0.00
instance n=20 270.alb	1	0	Optimal	0.09	7	7.00	0.00
instance n=20 271.alb	1	0	Optimal	0.11	6	6.00	0.00
instance n=20 272.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 273.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 274.alb	1	0	Optimal	0.11	6	6.00	0.00
instance n=20 275.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 276.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 277.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 278.alb	1	0	Optimal	0.11	6	6.00	0.00
instance n=20 279.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 28.alb	1	0	Optimal	1.92	12	12.00	0.00
instance n=20 280.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 281.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 282.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 283.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 284.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 285.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 286.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 287.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 288.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 289.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 29.alb	1	0	Optimal	0.02	10	10.00	0.00
instance n=20 290.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 291.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 292.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 293.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 294.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 295.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 296.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 297.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 298.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 299.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 3.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 30.alb	1	0	Optimal	12.29	16	16.00	0.00
instance n=20 300.alb	1	0	Optimal	0.04	4	4.00	0.00
instance n=20 301.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 302.alb	1	0	Optimal	0.02	3	3.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 303.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 304.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 305.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 306.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 307.alb	1	0	Optimal	0.04	3	3.00	0.00
instance n=20 308.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 309.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 31.alb	1	0	Optimal	0.49	12	12.00	0.00
instance n=20 310.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 311.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 312.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 313.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 314.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 315.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 316.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 317.alb	1	0	Optimal	0.30	10	10.00	0.00
instance n=20 318.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 319.alb	1	0	Optimal	3.37	14	14.00	0.00
instance n=20 32.alb	1	0	Optimal	13.44	13	13.00	0.00
instance n=20 320.alb	1	0	Optimal	0.46	12	12.00	0.00
instance n=20 321.alb	1	0	Solution	30.02	14	12.00	14.29
instance n=20 322.alb	1	0	Optimal	3.34	12	12.00	0.00
instance n=20 323.alb	1	0	Optimal	2.38	13	13.00	0.00
instance n=20 324.alb	1	0	Optimal	0.09	9	9.00	0.00
instance n=20 325.alb	1	0	Optimal	20.95	14	14.00	0.00
instance n=20 326.alb	1	0	Optimal	6.60	14	14.00	0.00
instance n=20 327.alb	1	0	Optimal	6.61	13	13.00	0.00
instance n=20 328.alb	1	0	Optimal	4.54	13	13.00	0.00
instance n=20 329.alb	1	0	Optimal	0.04	10	10.00	0.00
instance n=20 33.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 330.alb	1	0	Optimal	3.45	12	12.00	0.00
instance n=20 331.alb	1	0	Optimal	6.17	13	13.00	0.00
instance n=20 332.alb	1	0	Optimal	1.07	13	13.00	0.00
instance n=20 333.alb	1	0	Optimal	0.25	11	11.00	0.00
instance n=20 334.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 335.alb	1	0	Solution	30.01	14	11.00	21.43
instance n=20 336.alb	1	0	Optimal	0.17	11	11.00	0.00
instance n=20 337.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 338.alb	1	0	Optimal	3.81	14	14.00	0.00
instance n=20 339.alb	1	0	Optimal	5.20	13	13.00	0.00
instance n=20 34.alb	1	0	Optimal	1.13	12	12.00	0.00
instance n=20 340.alb	1	0	Optimal	0.39	11	11.00	0.00
instance n=20 341.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 342.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 343.alb	1	0	Optimal	0.02	6	6.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 344.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 345.alb	1	0	Optimal	0.04	4	4.00	0.00
instance n=20 346.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 347.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 348.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 349.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 35.alb	1	0	Optimal	0.41	12	12.00	0.00
instance n=20 350.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 351.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 352.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 353.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 354.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 355.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 356.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 357.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 358.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 359.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 36.alb	1	0	Optimal	0.85	13	13.00	0.00
instance n=20 360.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 361.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 362.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 363.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=20 364.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 365.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 366.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 367.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 368.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 369.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 37.alb	1	0	Optimal	0.58	12	12.00	0.00
instance n=20 370.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 371.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 372.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 373.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 374.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 375.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 376.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 377.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 378.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 379.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 38.alb	1	0	Optimal	0.19	12	12.00	0.00
instance n=20 380.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 381.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 382.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 383.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 384.alb	1	0	Optimal	0.02	3	3.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 385.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 386.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 387.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 388.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 389.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 39.alb	1	0	Optimal	0.32	13	13.00	0.00
instance n=20 390.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 391.alb	1	0	Optimal	0.11	11	10.00	9.09
instance n=20 392.alb	1	0	Optimal	0.24	14	14.00	0.00
instance n=20 393.alb	1	0	Optimal	0.19	11	10.00	9.09
instance n=20 394.alb	1	0	Optimal	0.19	12	12.00	0.00
instance n=20 395.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 396.alb	1	0	Optimal	0.33	13	13.00	0.00
instance n=20 397.alb	1	0	Optimal	0.10	10	10.00	0.00
instance n=20 398.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 399.alb	1	0	Optimal	0.25	13	13.00	0.00
instance n=20 4.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 40.alb	1	0	Optimal	1.21	12	12.00	0.00
instance n=20 400.alb	1	0	Optimal	0.17	12	12.00	0.00
instance n=20 401.alb	1	0	Optimal	0.19	12	12.00	0.00
instance n=20 402.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 403.alb	1	0	Optimal	0.17	12	12.00	0.00
instance n=20 404.alb	1	0	Optimal	0.20	10	10.00	0.00
instance n=20 405.alb	1	0	Optimal	0.17	12	12.00	0.00
instance n=20 406.alb	1	0	Optimal	0.61	14	14.00	0.00
instance n=20 407.alb	1	0	Optimal	0.05	10	10.00	0.00
instance n=20 408.alb	1	0	Optimal	0.42	14	14.00	0.00
instance n=20 409.alb	1	0	Optimal	0.16	12	12.00	0.00
instance n=20 41.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 410.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 411.alb	1	0	Optimal	0.87	15	15.00	0.00
instance n=20 412.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 413.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 414.alb	1	0	Optimal	0.37	12	12.00	0.00
instance n=20 415.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 416.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 417.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 418.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 419.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 42.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 420.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 421.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 422.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 423.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 424.alb	1	0	Optimal	0.04	5	5.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 425.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 426.alb	1	0	Optimal	0.04	5	5.00	0.00
instance n=20 427.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 428.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 429.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 43.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 430.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 431.alb	1	0	Optimal	0.04	6	6.00	0.00
instance n=20 432.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 433.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 434.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 435.alb	1	0	Optimal	0.12	7	7.00	0.00
instance n=20 436.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 437.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 438.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 439.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 44.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 440.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 441.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 442.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 443.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 444.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 445.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 446.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 447.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 448.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 449.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 45.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 450.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 451.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 452.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 453.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 454.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 455.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 456.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 457.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 458.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 459.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 46.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 460.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 461.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 462.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 463.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 464.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 465.alb	1	0	Optimal	0.01	3	3.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 466.alb	1	0	Optimal	0.11	13	13.00	0.00
instance n=20 467.alb	1	0	Optimal	0.11	14	14.00	0.00
instance n=20 468.alb	1	0	Optimal	0.10	13	13.00	0.00
instance n=20 469.alb	1	0	Optimal	0.09	14	14.00	0.00
instance n=20 47.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 470.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 471.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 472.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=20 473.alb	1	0	Optimal	0.11	10	10.00	0.00
instance n=20 474.alb	1	0	Optimal	0.10	14	14.00	0.00
instance n=20 475.alb	1	0	Optimal	0.13	11	11.00	0.00
instance n=20 476.alb	1	0	Optimal	0.08	11	11.00	0.00
instance n=20 477.alb	1	0	Optimal	0.10	11	11.00	0.00
instance n=20 478.alb	1	0	Optimal	0.12	12	12.00	0.00
instance n=20 479.alb	1	0	Optimal	0.10	13	13.00	0.00
instance n=20 48.alb	1	0	Optimal	0.05	5	5.00	0.00
instance n=20 480.alb	1	0	Optimal	0.10	13	13.00	0.00
instance n=20 481.alb	1	0	Optimal	0.10	13	13.00	0.00
instance n=20 482.alb	1	0	Optimal	0.11	13	13.00	0.00
instance n=20 483.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=20 484.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=20 485.alb	1	0	Optimal	0.09	15	15.00	0.00
instance n=20 486.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=20 487.alb	1	0	Optimal	0.10	12	12.00	0.00
instance n=20 488.alb	1	0	Optimal	0.09	15	15.00	0.00
instance n=20 489.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 49.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 490.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=20 491.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 492.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 493.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 494.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 495.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 496.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 497.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 498.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 499.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 5.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 50.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 500.alb	1	0	Optimal	0.12	8	8.00	0.00
instance n=20 501.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 502.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 503.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 504.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 505.alb	1	0	Optimal	0.03	6	6.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 506.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 507.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 508.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 509.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 51.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 510.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 511.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 512.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 513.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 514.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 515.alb	1	0	Optimal	0.11	6	6.00	0.00
instance n=20 516.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 517.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 518.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 519.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 52.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 520.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 521.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 522.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 523.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 524.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 525.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 53.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 54.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 55.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 56.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 57.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 58.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 59.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 6.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 60.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 61.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=20 62.alb	1	0	Optimal	0.04	5	5.00	0.00
instance n=20 63.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 64.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 65.alb	1	0	Optimal	0.04	5	5.00	0.00
instance n=20 66.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 67.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 68.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 69.alb	1	0	Optimal	0.02	2	2.00	0.00
instance n=20 7.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 70.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 71.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 72.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 73.alb	1	0	Optimal	0.02	2	2.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 74.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 75.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 76.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 77.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 78.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 79.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 8.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 80.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 81.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 82.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 83.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 84.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 85.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 86.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 87.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 88.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 89.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 9.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 90.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 91.alb	1	0	Optimal	0.10	11	11.00	0.00
instance n=20 92.alb	1	0	Optimal	0.11	11	11.00	0.00
instance n=20 93.alb	1	0	Optimal	0.25	13	13.00	0.00
instance n=20 94.alb	1	0	Optimal	0.02	10	10.00	0.00
instance n=20 95.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=20 96.alb	1	0	Optimal	0.09	10	10.00	0.00
instance n=20 97.alb	1	0	Optimal	1.15	15	15.00	0.00
instance n=20 98.alb	1	0	Optimal	0.25	13	13.00	0.00
instance n=20 99.alb	1	0	Optimal	0.29	12	12.00	0.00
instance n=50 1.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 10.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 100.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 101.alb	1	0	Solution	30.01	30	27.00	10.00
instance n=50 102.alb	1	0	Solution	30.02	32	28.00	12.50
instance n=50 103.alb	1	0	Solution	30.02	29	26.00	10.34
instance n=50 104.alb	1	0	Solution	30.00	27	25.00	7.41
instance n=50 105.alb	1	0	Solution	30.02	24	23.00	4.17
instance n=50 106.alb	1	0	Solution	30.02	28	26.00	7.14
instance n=50 107.alb	1	0	Solution	30.00	28	27.00	3.57
instance n=50 108.alb	1	0	Solution	30.01	30	27.00	10.00
instance n=50 109.alb	1	0	Solution	30.01	30	25.00	16.67
instance n=50 11.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 110.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 111.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 112.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 113.alb	1	0	Solution	30.01	28	26.00	7.14

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 114.alb	1	0	Solution	30.02	27	25.00	7.41
instance n=50 115.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 116.alb	1	0	Solution	30.01	32	27.00	15.63
instance n=50 117.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 118.alb	1	0	Solution	30.01	29	27.00	6.90
instance n=50 119.alb	1	0	Optimal	3.42	25	25.00	0.00
instance n=50 12.alb	1	0	Optimal	0.05	6	6.00	0.00
instance n=50 120.alb	1	0	Solution	30.01	27	26.00	3.70
instance n=50 121.alb	1	0	Solution	30.01	32	27.00	15.63
instance n=50 122.alb	1	0	Solution	30.01	29	28.00	3.45
instance n=50 123.alb	1	0	Solution	30.02	32	27.00	15.63
instance n=50 124.alb	1	0	Solution	30.01	29	27.00	6.90
instance n=50 125.alb	1	0	Solution	30.01	33	27.00	18.18
instance n=50 126.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=50 127.alb	1	0	Optimal	0.02	14	14.00	0.00
instance n=50 128.alb	1	0	Optimal	0.16	12	12.00	0.00
instance n=50 129.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 13.alb	1	0	Optimal	0.05	6	6.00	0.00
instance n=50 130.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 131.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 132.alb	1	0	Optimal	0.60	12	12.00	0.00
instance n=50 133.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 134.alb	1	0	Optimal	0.47	14	14.00	0.00
instance n=50 135.alb	1	0	Optimal	0.17	13	13.00	0.00
instance n=50 136.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 137.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 138.alb	1	0	Optimal	0.06	12	12.00	0.00
instance n=50 139.alb	1	0	Optimal	1.34	11	11.00	0.00
instance n=50 14.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 140.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 141.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 142.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 143.alb	1	0	Optimal	0.13	12	12.00	0.00
instance n=50 144.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=50 145.alb	1	0	Optimal	0.10	10	10.00	0.00
instance n=50 146.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 147.alb	1	0	Optimal	0.10	13	13.00	0.00
instance n=50 148.alb	1	0	Optimal	0.04	10	10.00	0.00
instance n=50 149.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 15.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 150.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 151.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 152.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 153.alb	1	0	Optimal	0.24	7	7.00	0.00
instance n=50 154.alb	1	0	Optimal	0.06	8	8.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 155.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 156.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 157.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 158.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 159.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 16.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 160.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 161.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 162.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 163.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 164.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 165.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 166.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 167.alb	1	0	Optimal	0.20	7	7.00	0.00
instance n=50 168.alb	1	0	Optimal	0.20	8	8.00	0.00
instance n=50 169.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 17.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 170.alb	1	0	Optimal	0.11	7	7.00	0.00
instance n=50 171.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 172.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 173.alb	1	0	Optimal	0.11	7	7.00	0.00
instance n=50 174.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 175.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 176.alb	1	0	Solution	30.02	27	25.00	7.41
instance n=50 177.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 178.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 179.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 18.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 180.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 181.alb	1	0	Solution	30.00	29	27.00	6.90
instance n=50 182.alb	1	0	Solution	30.02	27	25.00	7.41
instance n=50 183.alb	1	0	Solution	30.00	29	26.00	10.34
instance n=50 184.alb	1	0	Solution	30.00	38	29.00	23.68
instance n=50 185.alb	1	0	Solution	30.02	27	25.00	7.41
instance n=50 186.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 187.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 188.alb	1	0	Solution	30.01	25	24.00	4.00
instance n=50 189.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 19.alb	1	0	Optimal	0.02	8	8.00	0.00
instance n=50 190.alb	1	0	Solution	29.99	30	26.00	13.33
instance n=50 191.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 192.alb	1	0	Solution	30.01	27	26.00	3.70
instance n=50 193.alb	1	0	Solution	30.00	28	27.00	3.57
instance n=50 194.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 195.alb	1	0	Solution	30.03	28	26.00	7.14

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 196.alb	1	0	Solution	30.01	27	26.00	3.70
instance n=50 197.alb	1	0	Solution	30.02	28	26.00	7.14
instance n=50 198.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 199.alb	1	0	Solution	30.01	29	27.00	6.90
instance n=50 2.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 20.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 200.alb	1	0	Solution	30.01	25	24.00	4.00
instance n=50 201.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 202.alb	1	0	Optimal	0.08	9	9.00	0.00
instance n=50 203.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=50 204.alb	1	0	Optimal	0.26	10	10.00	0.00
instance n=50 205.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 206.alb	1	0	Optimal	3.34	11	11.00	0.00
instance n=50 207.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=50 208.alb	1	0	Optimal	0.08	13	13.00	0.00
instance n=50 209.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 21.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 210.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 211.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 212.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=50 213.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 214.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 215.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 216.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 217.alb	1	0	Optimal	0.31	13	13.00	0.00
instance n=50 218.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 219.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 22.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 220.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 221.alb	1	0	Optimal	0.24	11	11.00	0.00
instance n=50 222.alb	1	0	Optimal	0.04	14	14.00	0.00
instance n=50 223.alb	1	0	Optimal	0.42	11	11.00	0.00
instance n=50 224.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=50 225.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 226.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 227.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 228.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 229.alb	1	0	Optimal	0.04	6	6.00	0.00
instance n=50 23.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 230.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 231.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 232.alb	1	0	Optimal	0.19	7	7.00	0.00
instance n=50 233.alb	1	0	Optimal	0.05	6	6.00	0.00
instance n=50 234.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 235.alb	1	0	Optimal	0.03	7	7.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 236.alb	1	0	Optimal	0.10	7	7.00	0.00
instance n=50 237.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 238.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 239.alb	1	0	Optimal	0.08	7	7.00	0.00
instance n=50 24.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 240.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 241.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 242.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 243.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 244.alb	1	0	Optimal	0.09	7	7.00	0.00
instance n=50 245.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 246.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 247.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 248.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 249.alb	1	0	Optimal	0.08	7	7.00	0.00
instance n=50 25.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=50 250.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 251.alb	1	0	Solution	30.01	27	26.00	3.70
instance n=50 252.alb	1	0	Solution	30.02	32	28.00	12.50
instance n=50 253.alb	1	0	Solution	30.00	28	26.00	7.14
instance n=50 254.alb	1	0	Solution	30.01	30	27.00	10.00
instance n=50 255.alb	1	0	Solution	30.02	29	27.00	6.90
instance n=50 256.alb	1	0	Solution	30.01	30	28.00	6.67
instance n=50 257.alb	1	0	Solution	30.00	33	29.00	12.12
instance n=50 258.alb	1	0	Solution	30.02	28	27.00	3.57
instance n=50 259.alb	1	0	Solution	30.02	31	28.00	9.68
instance n=50 26.alb	1	0	Solution	30.02	27	25.00	7.41
instance n=50 260.alb	1	0	Solution	30.00	29	27.00	6.90
instance n=50 261.alb	1	0	Solution	30.02	28	27.00	3.57
instance n=50 262.alb	1	0	Solution	30.01	31	26.00	16.13
instance n=50 263.alb	1	0	Solution	30.00	29	28.00	3.45
instance n=50 264.alb	1	0	Solution	30.02	27	26.00	3.70
instance n=50 265.alb	1	0	Solution	30.01	27	26.00	3.70
instance n=50 266.alb	1	0	Optimal	22.15	29	29.00	0.00
instance n=50 267.alb	1	0	Solution	30.01	28	27.00	3.57
instance n=50 268.alb	1	0	Solution	30.01	29	27.00	6.90
instance n=50 269.alb	1	0	Optimal	5.27	26	26.00	0.00
instance n=50 27.alb	1	0	Solution	30.01	30	27.00	10.00
instance n=50 270.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 271.alb	1	0	Solution	30.00	31	28.00	9.68
instance n=50 272.alb	1	0	Solution	30.02	27	26.00	3.70
instance n=50 273.alb	1	0	Optimal	29.40	27	27.00	0.00
instance n=50 274.alb	1	0	Solution	30.02	29	27.00	6.90
instance n=50 275.alb	1	0	Optimal	1.92	27	27.00	0.00
instance n=50 276.alb	1	0	Optimal	0.18	12	12.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 277.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 278.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=50 279.alb	1	0	Optimal	0.01	11	11.00	0.00
instance n=50 28.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 280.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 281.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 282.alb	1	0	Optimal	1.01	12	12.00	0.00
instance n=50 283.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=50 284.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 285.alb	1	0	Optimal	0.17	13	13.00	0.00
instance n=50 286.alb	1	0	Optimal	0.19	11	11.00	0.00
instance n=50 287.alb	1	0	Optimal	0.17	12	12.00	0.00
instance n=50 288.alb	1	0	Optimal	0.10	10	10.00	0.00
instance n=50 289.alb	1	0	Optimal	0.18	11	11.00	0.00
instance n=50 29.alb	1	0	Solution	30.01	29	25.00	13.79
instance n=50 290.alb	1	0	Optimal	0.08	14	14.00	0.00
instance n=50 291.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 292.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 293.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 294.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 295.alb	1	0	Optimal	0.30	16	16.00	0.00
instance n=50 296.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 297.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 298.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=50 299.alb	1	0	Optimal	0.58	12	12.00	0.00
instance n=50 3.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 30.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 300.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 301.alb	1	0	Optimal	0.05	6	6.00	0.00
instance n=50 302.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 303.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 304.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 305.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 306.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 307.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 308.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 309.alb	1	0	Optimal	0.09	7	7.00	0.00
instance n=50 31.alb	1	0	Solution	30.00	28	25.00	10.71
instance n=50 310.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 311.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 312.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 313.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 314.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 315.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 316.alb	1	0	Optimal	0.03	8	8.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 317.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 318.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 319.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 32.alb	1	0	Optimal	2.00	25	25.00	0.00
instance n=50 320.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 321.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 322.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 323.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 324.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 325.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 326.alb	1	0	Solution	30.01	33	28.00	15.15
instance n=50 327.alb	1	0	Solution	30.01	28	25.00	10.71
instance n=50 328.alb	1	0	Solution	30.01	32	28.00	12.50
instance n=50 329.alb	1	0	Solution	30.00	25	24.00	4.00
instance n=50 33.alb	1	0	Solution	30.03	25	24.00	4.00
instance n=50 330.alb	1	0	Solution	30.00	29	25.00	13.79
instance n=50 331.alb	1	0	Solution	30.02	29	27.00	6.90
instance n=50 332.alb	1	0	Solution	30.01	25	24.00	4.00
instance n=50 333.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 334.alb	1	0	Solution	30.02	29	25.00	13.79
instance n=50 335.alb	1	0	Solution	30.01	27	26.00	3.70
instance n=50 336.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 337.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 338.alb	1	0	Solution	30.00	27	26.00	3.70
instance n=50 339.alb	1	0	Solution	30.02	27	26.00	3.70
instance n=50 34.alb	1	0	Solution	30.01	30	27.00	10.00
instance n=50 340.alb	1	0	Solution	29.99	28	26.00	7.14
instance n=50 341.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 342.alb	1	0	Solution	30.00	28	26.00	7.14
instance n=50 343.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 344.alb	1	0	Solution	30.01	30	27.00	10.00
instance n=50 345.alb	1	0	Solution	30.02	29	27.00	6.90
instance n=50 346.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 347.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 348.alb	1	0	Solution	30.02	30	25.00	16.67
instance n=50 349.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 35.alb	1	0	Solution	30.01	32	27.00	15.63
instance n=50 350.alb	1	0	Solution	30.00	24	23.00	4.17
instance n=50 351.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=50 352.alb	1	0	Optimal	0.58	10	10.00	0.00
instance n=50 353.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 354.alb	1	0	Optimal	26.53	13	13.00	0.00
instance n=50 355.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 356.alb	1	0	Optimal	0.03	15	15.00	0.00
instance n=50 357.alb	1	0	Optimal	0.02	12	12.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 358.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=50 359.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=50 36.alb	1	0	Solution	30.02	31	27.00	12.90
instance n=50 360.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 361.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 362.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=50 363.alb	1	0	Solution	30.00	12	11.00	8.33
instance n=50 364.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 365.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=50 366.alb	1	0	Optimal	0.02	13	13.00	0.00
instance n=50 367.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 368.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 369.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 37.alb	1	0	Solution	30.01	32	27.00	15.63
instance n=50 370.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 371.alb	1	0	Optimal	0.41	11	11.00	0.00
instance n=50 372.alb	1	0	Optimal	0.25	10	10.00	0.00
instance n=50 373.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 374.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 375.alb	1	0	Optimal	0.16	13	13.00	0.00
instance n=50 376.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 377.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 378.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 379.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 38.alb	1	0	Solution	30.01	31	28.00	9.68
instance n=50 380.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 381.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 382.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 383.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 384.alb	1	0	Optimal	0.17	8	8.00	0.00
instance n=50 385.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 386.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 387.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 388.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 389.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 39.alb	1	0	Solution	30.01	29	26.00	10.34
instance n=50 390.alb	1	0	Optimal	0.19	7	7.00	0.00
instance n=50 391.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 392.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 393.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 394.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 395.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 396.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 397.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 398.alb	1	0	Optimal	0.09	6	6.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 399.alb	1	0	Optimal	0.27	7	7.00	0.00
instance n=50 4.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 40.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 400.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 401.alb	1	0	Solution	30.00	28	26.00	7.14
instance n=50 402.alb	1	0	Solution	30.00	27	26.00	3.70
instance n=50 403.alb	1	0	Solution	30.00	34	30.00	11.76
instance n=50 404.alb	1	0	Solution	30.02	31	26.00	16.13
instance n=50 405.alb	1	0	Solution	30.00	27	26.00	3.70
instance n=50 406.alb	1	0	Solution	30.01	32	30.00	6.25
instance n=50 407.alb	1	0	Solution	30.02	29	26.00	10.34
instance n=50 408.alb	1	0	Optimal	6.43	26	26.00	0.00
instance n=50 409.alb	1	0	Solution	30.01	33	27.00	18.18
instance n=50 41.alb	1	0	Solution	30.01	26	25.00	3.85
instance n=50 410.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 411.alb	1	0	Solution	30.01	29	28.00	3.45
instance n=50 412.alb	1	0	Optimal	18.72	26	26.00	0.00
instance n=50 413.alb	1	0	Solution	30.01	30	26.00	13.33
instance n=50 414.alb	1	0	Solution	30.01	27	26.00	3.70
instance n=50 415.alb	1	0	Solution	30.02	28	26.00	7.14
instance n=50 416.alb	1	0	Solution	30.00	27	26.00	3.70
instance n=50 417.alb	1	0	Solution	30.02	30	27.00	10.00
instance n=50 418.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 419.alb	1	0	Solution	30.02	33	28.00	15.15
instance n=50 42.alb	1	0	Solution	30.01	24	23.00	4.17
instance n=50 420.alb	1	0	Solution	30.01	28	26.00	7.14
instance n=50 421.alb	1	0	Solution	30.01	34	29.00	14.71
instance n=50 422.alb	1	0	Solution	30.01	29	26.00	10.34
instance n=50 423.alb	1	0	Solution	30.01	29	26.00	10.34
instance n=50 424.alb	1	0	Solution	30.01	27	26.00	3.70
instance n=50 425.alb	1	0	Solution	30.01	34	29.00	14.71
instance n=50 426.alb	1	0	Optimal	0.17	11	11.00	0.00
instance n=50 427.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 428.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 429.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 43.alb	1	0	Optimal	1.45	25	25.00	0.00
instance n=50 430.alb	1	0	Optimal	0.14	14	14.00	0.00
instance n=50 431.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=50 432.alb	1	0	Optimal	0.17	12	12.00	0.00
instance n=50 433.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 434.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 435.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=50 436.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 437.alb	1	0	Optimal	0.90	12	12.00	0.00
instance n=50 438.alb	1	0	Optimal	0.66	10	10.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 439.alb	1	0	Optimal	0.33	12	12.00	0.00
instance n=50 44.alb	1	0	Solution	30.01	25	24.00	4.00
instance n=50 440.alb	1	0	Optimal	1.05	13	13.00	0.00
instance n=50 441.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 442.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 443.alb	1	0	Optimal	0.17	11	11.00	0.00
instance n=50 444.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 445.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 446.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=50 447.alb	1	0	Optimal	0.08	13	13.00	0.00
instance n=50 448.alb	1	0	Optimal	0.99	12	12.00	0.00
instance n=50 449.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 45.alb	1	0	Solution	30.02	25	24.00	4.00
instance n=50 450.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 451.alb	1	0	Optimal	0.05	8	8.00	0.00
instance n=50 452.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 453.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 454.alb	1	0	Optimal	0.09	8	8.00	0.00
instance n=50 455.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 456.alb	1	0	Optimal	0.05	8	8.00	0.00
instance n=50 457.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 458.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 459.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 46.alb	1	0	Solution	30.00	28	26.00	7.14
instance n=50 460.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 461.alb	1	0	Optimal	0.06	6	6.00	0.00
instance n=50 462.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 463.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 464.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 465.alb	1	0	Optimal	0.05	8	8.00	0.00
instance n=50 466.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 467.alb	1	0	Optimal	0.08	9	9.00	0.00
instance n=50 468.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 469.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 47.alb	1	0	Solution	30.00	28	26.00	7.14
instance n=50 470.alb	1	0	Optimal	0.05	8	8.00	0.00
instance n=50 471.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 472.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 473.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 474.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 475.alb	1	0	Optimal	0.10	6	6.00	0.00
instance n=50 476.alb	1	0	Optimal	0.26	28	28.00	0.00
instance n=50 477.alb	1	0	Optimal	0.99	29	29.00	0.00
instance n=50 478.alb	1	0	Optimal	1.32	32	32.00	0.00
instance n=50 479.alb	1	0	Optimal	0.15	28	28.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 48.alb	1	0	Solution	30.00	27	26.00	3.70
instance n=50 480.alb	1	0	Optimal	0.19	34	34.00	0.00
instance n=50 481.alb	1	0	Optimal	0.33	28	28.00	0.00
instance n=50 482.alb	1	0	Optimal	0.22	27	27.00	0.00
instance n=50 483.alb	1	0	Optimal	0.87	30	30.00	0.00
instance n=50 484.alb	1	0	Optimal	0.27	32	32.00	0.00
instance n=50 485.alb	1	0	Optimal	0.31	31	31.00	0.00
instance n=50 486.alb	1	0	Optimal	0.19	32	31.00	3.13
instance n=50 487.alb	1	0	Optimal	0.47	31	31.00	0.00
instance n=50 488.alb	1	0	Optimal	0.90	31	31.00	0.00
instance n=50 489.alb	1	0	Optimal	0.78	35	35.00	0.00
instance n=50 49.alb	1	0	Solution	30.00	25	24.00	4.00
instance n=50 490.alb	1	0	Optimal	0.30	29	29.00	0.00
instance n=50 491.alb	1	0	Optimal	9.55	35	35.00	0.00
instance n=50 492.alb	1	0	Optimal	0.91	29	29.00	0.00
instance n=50 493.alb	1	0	Optimal	1.09	30	30.00	0.00
instance n=50 494.alb	1	0	Optimal	0.55	32	32.00	0.00
instance n=50 495.alb	1	0	Optimal	0.50	34	34.00	0.00
instance n=50 496.alb	1	0	Optimal	0.49	29	29.00	0.00
instance n=50 497.alb	1	0	Optimal	0.94	30	30.00	0.00
instance n=50 498.alb	1	0	Optimal	0.19	30	30.00	0.00
instance n=50 499.alb	1	0	Optimal	0.25	33	33.00	0.00
instance n=50 5.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 50.alb	1	0	Solution	30.01	27	25.00	7.41
instance n=50 500.alb	1	0	Optimal	0.33	34	34.00	0.00
instance n=50 501.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 502.alb	1	0	Optimal	0.06	10	10.00	0.00
instance n=50 503.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=50 504.alb	1	0	Optimal	0.08	11	11.00	0.00
instance n=50 505.alb	1	0	Optimal	0.10	12	12.00	0.00
instance n=50 506.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 507.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 508.alb	1	0	Optimal	0.09	14	14.00	0.00
instance n=50 509.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 51.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=50 510.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=50 511.alb	1	0	Optimal	0.10	13	13.00	0.00
instance n=50 512.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=50 513.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 514.alb	1	0	Optimal	0.10	12	12.00	0.00
instance n=50 515.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=50 516.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=50 517.alb	1	0	Optimal	0.08	14	14.00	0.00
instance n=50 518.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=50 519.alb	1	0	Optimal	0.03	12	12.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 52.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 520.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 521.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=50 522.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 523.alb	1	0	Optimal	0.11	11	11.00	0.00
instance n=50 524.alb	1	0	Optimal	0.09	14	14.00	0.00
instance n=50 525.alb	1	0	Optimal	0.09	11	11.00	0.00
instance n=50 53.alb	1	0	Solution	30.01	13	12.00	7.69
instance n=50 54.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 55.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 56.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 57.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 58.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=50 59.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 6.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 60.alb	1	0	Optimal	0.16	12	12.00	0.00
instance n=50 61.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 62.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 63.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 64.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=50 65.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 66.alb	1	0	Optimal	0.17	12	12.00	0.00
instance n=50 67.alb	1	0	Optimal	0.25	12	12.00	0.00
instance n=50 68.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 69.alb	1	0	Optimal	0.16	12	12.00	0.00
instance n=50 7.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 70.alb	1	0	Optimal	0.05	10	10.00	0.00
instance n=50 71.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 72.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=50 73.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=50 74.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=50 75.alb	1	0	Optimal	0.41	11	11.00	0.00
instance n=50 76.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 77.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 78.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 79.alb	1	0	Optimal	0.09	8	8.00	0.00
instance n=50 8.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 80.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 81.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 82.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 83.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 84.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 85.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 86.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 87.alb	1	0	Optimal	0.04	8	8.00	0.00

Table 6.1: Results for SALBP-1 Problems (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 88.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 89.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 9.alb	1	0	Optimal	0.03	9	9.00	0.00
instance n=50 90.alb	1	0	Optimal	0.21	7	7.00	0.00
instance n=50 91.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 92.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 93.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 94.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 95.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 96.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 97.alb	1	0	Optimal	0.09	7	7.00	0.00
instance n=50 98.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 99.alb	1	0	Optimal	0.03	7	7.00	0.00

6.2 Results for CPSat

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 1.alb	1	0	Solution	30.06	136	92.00	32.35
instance n=1000 10.alb	1	0	Solution	30.06	141	91.00	35.46
instance n=1000 100.alb	1	0	Solution	30.08	139	137.00	1.44
instance n=1000 101.alb	1	0	Solution	30.13	565	383.00	32.21
instance n=1000 102.alb	1	0	Solution	30.18	562	402.00	28.47
instance n=1000 103.alb	1	0	Solution	30.15	567	443.00	21.87
instance n=1000 104.alb	1	0	Solution	30.15	556	417.00	25.00
instance n=1000 105.alb	1	0	Solution	30.16	552	403.00	26.99
instance n=1000 106.alb	1	0	Solution	30.16	557	415.00	25.49
instance n=1000 107.alb	1	0	Solution	30.06	543	400.00	26.34
instance n=1000 108.alb	1	0	Solution	30.15	552	398.00	27.90
instance n=1000 109.alb	1	0	Solution	30.15	550	401.00	27.09
instance n=1000 11.alb	1	0	Solution	30.06	136	89.00	34.56
instance n=1000 110.alb	1	0	Solution	30.07	566	406.00	28.27
instance n=1000 111.alb	1	0	Solution	30.16	552	418.00	24.28
instance n=1000 112.alb	1	0	Solution	30.16	548	412.00	24.82
instance n=1000 113.alb	1	0	Solution	30.09	546	433.00	20.70
instance n=1000 114.alb	1	0	Solution	30.14	555	398.00	28.29
instance n=1000 115.alb	1	0	Solution	30.19	545	389.00	28.62
instance n=1000 116.alb	1	0	Solution	30.17	554	395.00	28.70
instance n=1000 117.alb	1	0	Solution	30.14	556	400.00	28.06

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 118.alb	1	0	Solution	30.13	566	396.00	30.04
instance n=1000 119.alb	1	0	Solution	30.14	536	392.00	26.87
instance n=1000 12.alb	1	0	Solution	30.05	135	89.00	34.07
instance n=1000 120.alb	1	0	Solution	30.16	556	434.00	21.94
instance n=1000 121.alb	1	0	Solution	30.17	546	436.00	20.15
instance n=1000 122.alb	1	0	Solution	30.14	537	432.00	19.55
instance n=1000 123.alb	1	0	Solution	30.13	562	408.00	27.40
instance n=1000 124.alb	1	0	Solution	30.13	548	429.00	21.72
instance n=1000 125.alb	1	0	Solution	30.13	550	414.00	24.73
instance n=1000 126.alb	1	0	Solution	30.08	233	207.00	11.16
instance n=1000 127.alb	1	0	Solution	30.08	224	200.00	10.71
instance n=1000 128.alb	1	0	Solution	30.09	226	201.00	11.06
instance n=1000 129.alb	1	0	Solution	30.09	227	196.00	13.66
instance n=1000 13.alb	1	0	Solution	30.04	133	90.00	32.33
instance n=1000 130.alb	1	0	Solution	30.07	225	210.00	6.67
instance n=1000 131.alb	1	0	Solution	30.09	224	203.00	9.38
instance n=1000 132.alb	1	0	Solution	30.09	218	197.00	9.63
instance n=1000 133.alb	1	0	Solution	30.09	230	212.00	7.83
instance n=1000 134.alb	1	0	Solution	30.08	219	208.00	5.02
instance n=1000 135.alb	1	0	Solution	30.09	230	205.00	10.87
instance n=1000 136.alb	1	0	Solution	30.09	233	209.00	10.30
instance n=1000 137.alb	1	0	Solution	30.10	216	193.00	10.65
instance n=1000 138.alb	1	0	Solution	30.07	225	210.00	6.67
instance n=1000 139.alb	1	0	Solution	30.08	228	213.00	6.58
instance n=1000 14.alb	1	0	Solution	30.04	138	90.00	34.78
instance n=1000 140.alb	1	0	Solution	30.06	230	210.00	8.70
instance n=1000 141.alb	1	0	Solution	30.08	219	200.00	8.68
instance n=1000 142.alb	1	0	Solution	30.09	224	210.00	6.25
instance n=1000 143.alb	1	0	Solution	30.07	217	189.00	12.90
instance n=1000 144.alb	1	0	Solution	30.09	221	192.00	13.12
instance n=1000 145.alb	1	0	Solution	30.08	224	201.00	10.27
instance n=1000 146.alb	1	0	Solution	30.08	223	205.00	8.07
instance n=1000 147.alb	1	0	Solution	30.08	234	216.00	7.69
instance n=1000 148.alb	1	0	Solution	30.07	223	211.00	5.38
instance n=1000 149.alb	1	0	Solution	30.08	241	219.00	9.13
instance n=1000 15.alb	1	0	Solution	30.03	137	89.00	35.04
instance n=1000 150.alb	1	0	Solution	30.07	226	192.00	15.04
instance n=1000 151.alb	1	0	Solution	30.06	140	91.00	35.00
instance n=1000 152.alb	1	0	Solution	30.04	138	89.00	35.51
instance n=1000 153.alb	1	0	Solution	30.06	139	90.00	35.25
instance n=1000 154.alb	1	0	Solution	30.04	142	92.00	35.21
instance n=1000 155.alb	1	0	Solution	30.10	141	89.00	36.88
instance n=1000 156.alb	1	0	Solution	30.03	143	95.00	33.57
instance n=1000 157.alb	1	0	Solution	30.06	142	89.00	37.32

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 158.alb	1	0	Solution	30.04	137	89.00	35.04
instance n=1000 159.alb	1	0	Solution	30.17	140	91.00	35.00
instance n=1000 16.alb	1	0	Solution	30.04	138	91.00	34.06
instance n=1000 160.alb	1	0	Solution	30.06	140	87.00	37.86
instance n=1000 161.alb	1	0	Solution	30.05	134	89.00	33.58
instance n=1000 162.alb	1	0	Solution	30.06	138	87.00	36.96
instance n=1000 163.alb	1	0	Solution	30.05	141	91.00	35.46
instance n=1000 164.alb	1	0	Solution	30.07	143	92.00	35.66
instance n=1000 165.alb	1	0	Solution	30.04	137	89.00	35.04
instance n=1000 166.alb	1	0	Solution	30.07	141	90.00	36.17
instance n=1000 167.alb	1	0	Solution	30.05	141	89.00	36.88
instance n=1000 168.alb	1	0	Solution	30.07	140	90.00	35.71
instance n=1000 169.alb	1	0	Solution	30.08	136	91.00	33.09
instance n=1000 17.alb	1	0	Solution	30.04	136	90.00	33.82
instance n=1000 170.alb	1	0	Solution	30.06	136	88.00	35.29
instance n=1000 171.alb	1	0	Solution	30.04	139	91.00	34.53
instance n=1000 172.alb	1	0	Solution	30.05	136	88.00	35.29
instance n=1000 173.alb	1	0	Solution	30.04	137	91.00	33.58
instance n=1000 174.alb	1	0	Solution	30.05	138	96.00	30.43
instance n=1000 175.alb	1	0	Solution	30.05	140	89.00	36.43
instance n=1000 176.alb	1	0	Solution	30.09	577	274.00	52.51
instance n=1000 177.alb	1	0	Solution	30.12	568	279.00	50.88
instance n=1000 178.alb	1	0	Solution	30.05	573	278.00	51.48
instance n=1000 179.alb	1	0	Solution	30.16	580	280.00	51.72
instance n=1000 18.alb	1	0	Solution	30.04	135	89.00	34.07
instance n=1000 180.alb	1	0	Solution	30.09	580	277.00	52.24
instance n=1000 181.alb	1	0	Solution	30.15	584	279.00	52.23
instance n=1000 182.alb	1	0	Solution	30.14	576	275.00	52.26
instance n=1000 183.alb	1	0	Solution	30.12	564	273.00	51.60
instance n=1000 184.alb	1	0	Solution	30.11	575	272.00	52.70
instance n=1000 185.alb	1	0	Solution	30.11	567	271.00	52.20
instance n=1000 186.alb	1	0	Solution	30.11	570	277.00	51.40
instance n=1000 187.alb	1	0	Solution	30.13	584	280.00	52.05
instance n=1000 188.alb	1	0	Solution	30.05	571	279.00	51.14
instance n=1000 189.alb	1	0	Solution	30.10	567	273.00	51.85
instance n=1000 19.alb	1	0	Solution	30.05	138	91.00	34.06
instance n=1000 190.alb	1	0	Solution	30.11	573	275.00	52.01
instance n=1000 191.alb	1	0	Solution	30.11	575	276.00	52.00
instance n=1000 192.alb	1	0	Solution	30.06	568	281.00	50.53
instance n=1000 193.alb	1	0	Solution	30.11	582	283.00	51.37
instance n=1000 194.alb	1	0	Solution	30.12	580	278.00	52.07
instance n=1000 195.alb	1	0	Solution	30.11	576	279.00	51.56
instance n=1000 196.alb	1	0	Solution	30.10	574	276.00	51.92
instance n=1000 197.alb	1	0	Solution	30.15	558	274.00	50.90

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 198.alb	1	0	Solution	30.12	580	278.00	52.07
instance n=1000 199.alb	1	0	Solution	30.09	555	274.00	50.63
instance n=1000 2.alb	1	0	Solution	30.05	138	91.00	34.06
instance n=1000 20.alb	1	0	Solution	30.04	139	91.00	34.53
instance n=1000 200.alb	1	0	Solution	30.11	566	277.00	51.06
instance n=1000 201.alb	1	0	Solution	30.07	234	139.00	40.60
instance n=1000 202.alb	1	0	Solution	30.04	230	137.00	40.43
instance n=1000 203.alb	1	0	Solution	30.07	235	139.00	40.85
instance n=1000 204.alb	1	0	Solution	30.07	233	133.00	42.92
instance n=1000 205.alb	1	0	Solution	30.05	236	135.00	42.80
instance n=1000 206.alb	1	0	Solution	30.08	233	137.00	41.20
instance n=1000 207.alb	1	0	Solution	30.06	235	137.00	41.70
instance n=1000 208.alb	1	0	Solution	30.04	234	139.00	40.60
instance n=1000 209.alb	1	0	Solution	30.06	233	134.00	42.49
instance n=1000 21.alb	1	0	Solution	30.04	139	89.00	35.97
instance n=1000 210.alb	1	0	Solution	30.06	229	135.00	41.05
instance n=1000 211.alb	1	0	Solution	30.08	224	132.00	41.07
instance n=1000 212.alb	1	0	Solution	30.06	221	131.00	40.72
instance n=1000 213.alb	1	0	Solution	30.06	238	139.00	41.60
instance n=1000 214.alb	1	0	Solution	30.04	230	139.00	39.57
instance n=1000 215.alb	1	0	Solution	30.06	229	132.00	42.36
instance n=1000 216.alb	1	0	Solution	30.07	225	131.00	41.78
instance n=1000 217.alb	1	0	Solution	30.05	230	131.00	43.04
instance n=1000 218.alb	1	0	Solution	30.08	223	131.00	41.26
instance n=1000 219.alb	1	0	Solution	30.05	238	141.00	40.76
instance n=1000 22.alb	1	0	Solution	30.05	138	94.00	31.88
instance n=1000 220.alb	1	0	Solution	30.05	230	136.00	40.87
instance n=1000 221.alb	1	0	Solution	30.05	236	142.00	39.83
instance n=1000 222.alb	1	0	Solution	30.05	227	129.00	43.17
instance n=1000 223.alb	1	0	Solution	30.05	226	135.00	40.27
instance n=1000 224.alb	1	0	Solution	30.06	232	137.00	40.95
instance n=1000 225.alb	1	0	Solution	30.06	235	134.00	42.98
instance n=1000 226.alb	1	0	Solution	30.04	138	125.00	9.42
instance n=1000 227.alb	1	0	Solution	30.07	139	135.00	2.88
instance n=1000 228.alb	1	0	Solution	30.06	135	125.00	7.41
instance n=1000 229.alb	1	0	Solution	30.08	136	123.00	9.56
instance n=1000 23.alb	1	0	Solution	30.03	137	90.00	34.31
instance n=1000 230.alb	1	0	Solution	30.08	133	131.00	1.50
instance n=1000 231.alb	1	0	Solution	30.09	140	128.00	8.57
instance n=1000 232.alb	1	0	Solution	30.09	135	128.00	5.19
instance n=1000 233.alb	1	0	Solution	30.06	137	128.00	6.57
instance n=1000 234.alb	1	0	Solution	30.07	139	128.00	7.91
instance n=1000 235.alb	1	0	Solution	30.09	135	119.00	11.85
instance n=1000 236.alb	1	0	Solution	30.08	138	119.00	13.77

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 237.alb	1	0	Solution	30.07	140	128.00	8.57
instance n=1000 238.alb	1	0	Solution	30.06	140	129.00	7.86
instance n=1000 239.alb	1	0	Solution	30.08	137	129.00	5.84
instance n=1000 24.alb	1	0	Solution	30.05	141	93.00	34.04
instance n=1000 240.alb	1	0	Solution	30.07	137	120.00	12.41
instance n=1000 241.alb	1	0	Solution	30.06	140	112.00	20.00
instance n=1000 242.alb	1	0	Solution	30.06	137	125.00	8.76
instance n=1000 243.alb	1	0	Solution	30.07	139	136.00	2.16
instance n=1000 244.alb	1	0	Solution	30.09	139	132.00	5.04
instance n=1000 245.alb	1	0	Solution	30.05	137	125.00	8.76
instance n=1000 246.alb	1	0	Solution	30.08	137	128.00	6.57
instance n=1000 247.alb	1	0	Solution	30.08	141	130.00	7.80
instance n=1000 248.alb	1	0	Solution	30.07	141	122.00	13.48
instance n=1000 249.alb	1	0	Solution	30.08	140	132.00	5.71
instance n=1000 25.alb	1	0	Solution	30.05	137	90.00	34.31
instance n=1000 250.alb	1	0	Solution	30.07	142	135.00	4.93
instance n=1000 251.alb	1	0	Solution	30.14	587	415.00	29.30
instance n=1000 252.alb	1	0	Solution	30.21	583	392.00	32.76
instance n=1000 253.alb	1	0	Solution	30.16	580	369.00	36.38
instance n=1000 254.alb	1	0	Solution	30.16	582	382.00	34.36
instance n=1000 255.alb	1	0	Solution	30.15	569	390.00	31.46
instance n=1000 256.alb	1	0	Solution	30.17	570	405.00	28.95
instance n=1000 257.alb	1	0	Solution	30.16	584	370.00	36.64
instance n=1000 258.alb	1	0	Solution	30.13	579	387.00	33.16
instance n=1000 259.alb	1	0	Solution	30.15	571	395.00	30.82
instance n=1000 26.alb	1	0	Solution	30.10	570	274.00	51.93
instance n=1000 260.alb	1	0	Solution	30.10	568	400.00	29.58
instance n=1000 261.alb	1	0	Solution	30.17	581	366.00	37.01
instance n=1000 262.alb	1	0	Solution	30.19	563	382.00	32.15
instance n=1000 263.alb	1	0	Solution	30.17	572	386.00	32.52
instance n=1000 264.alb	1	0	Solution	30.19	578	407.00	29.58
instance n=1000 265.alb	1	0	Solution	30.16	594	404.00	31.99
instance n=1000 266.alb	1	0	Solution	30.14	574	374.00	34.84
instance n=1000 267.alb	1	0	Solution	30.14	590	364.00	38.31
instance n=1000 268.alb	1	0	Solution	30.15	567	383.00	32.45
instance n=1000 269.alb	1	0	Solution	30.15	570	406.00	28.77
instance n=1000 27.alb	1	0	Solution	30.14	569	272.00	52.20
instance n=1000 270.alb	1	0	Solution	30.15	603	394.00	34.66
instance n=1000 271.alb	1	0	Solution	30.20	567	378.00	33.33
instance n=1000 272.alb	1	0	Solution	30.15	584	400.00	31.51
instance n=1000 273.alb	1	0	Solution	30.14	578	391.00	32.35
instance n=1000 274.alb	1	0	Solution	30.09	583	371.00	36.36
instance n=1000 275.alb	1	0	Solution	30.16	586	401.00	31.57
instance n=1000 276.alb	1	0	Solution	30.09	223	155.00	30.49

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 277.alb	1	0	Solution	30.09	231	183.00	20.78
instance n=1000 278.alb	1	0	Solution	30.08	226	171.00	24.34
instance n=1000 279.alb	1	0	Solution	30.08	220	171.00	22.27
instance n=1000 28.alb	1	0	Solution	30.08	557	272.00	51.17
instance n=1000 280.alb	1	0	Solution	30.07	232	179.00	22.84
instance n=1000 281.alb	1	0	Solution	30.08	225	191.00	15.11
instance n=1000 282.alb	1	0	Solution	30.08	220	179.00	18.64
instance n=1000 283.alb	1	0	Solution	30.09	231	181.00	21.65
instance n=1000 284.alb	1	0	Solution	30.07	222	193.00	13.06
instance n=1000 285.alb	1	0	Solution	30.07	228	180.00	21.05
instance n=1000 286.alb	1	0	Solution	30.08	227	190.00	16.30
instance n=1000 287.alb	1	0	Solution	30.06	230	192.00	16.52
instance n=1000 288.alb	1	0	Solution	30.05	225	183.00	18.67
instance n=1000 289.alb	1	0	Solution	30.07	225	187.00	16.89
instance n=1000 29.alb	1	0	Solution	30.11	560	273.00	51.25
instance n=1000 290.alb	1	0	Solution	30.09	229	190.00	17.03
instance n=1000 291.alb	1	0	Solution	30.07	230	188.00	18.26
instance n=1000 292.alb	1	0	Solution	30.06	232	204.00	12.07
instance n=1000 293.alb	1	0	Solution	30.07	232	187.00	19.40
instance n=1000 294.alb	1	0	Solution	30.08	236	188.00	20.34
instance n=1000 295.alb	1	0	Solution	30.06	233	189.00	18.88
instance n=1000 296.alb	1	0	Solution	30.07	213	179.00	15.96
instance n=1000 297.alb	1	0	Solution	30.08	222	176.00	20.72
instance n=1000 298.alb	1	0	Solution	30.08	220	185.00	15.91
instance n=1000 299.alb	1	0	Solution	30.07	233	186.00	20.17
instance n=1000 3.alb	1	0	Solution	30.04	138	90.00	34.78
instance n=1000 30.alb	1	0	Solution	30.10	573	272.00	52.53
instance n=1000 300.alb	1	0	Solution	30.09	235	186.00	20.85
instance n=1000 301.alb	1	0	Solution	30.05	138	92.00	33.33
instance n=1000 302.alb	1	0	Solution	30.06	140	88.00	37.14
instance n=1000 303.alb	1	0	Solution	30.04	140	93.00	33.57
instance n=1000 304.alb	1	0	Solution	30.06	138	95.00	31.16
instance n=1000 305.alb	1	0	Solution	30.07	141	90.00	36.17
instance n=1000 306.alb	1	0	Solution	30.04	136	92.00	32.35
instance n=1000 307.alb	1	0	Solution	30.08	137	91.00	33.58
instance n=1000 308.alb	1	0	Solution	30.05	139	93.00	33.09
instance n=1000 309.alb	1	0	Solution	30.05	136	88.00	35.29
instance n=1000 31.alb	1	0	Solution	30.13	571	273.00	52.19
instance n=1000 310.alb	1	0	Solution	30.42	143	91.00	36.36
instance n=1000 311.alb	1	0	Solution	30.06	141	92.00	34.75
instance n=1000 312.alb	1	0	Solution	30.05	136	88.00	35.29
instance n=1000 313.alb	1	0	Solution	30.06	139	90.00	35.25
instance n=1000 314.alb	1	0	Solution	30.05	143	95.00	33.57
instance n=1000 315.alb	1	0	Solution	30.06	138	95.00	31.16

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 316.alb	1	0	Solution	30.05	139	90.00	35.25
instance n=1000 317.alb	1	0	Solution	30.05	137	91.00	33.58
instance n=1000 318.alb	1	0	Solution	30.04	139	91.00	34.53
instance n=1000 319.alb	1	0	Solution	30.25	142	91.00	35.92
instance n=1000 32.alb	1	0	Solution	30.08	567	277.00	51.15
instance n=1000 320.alb	1	0	Solution	30.06	142	96.00	32.39
instance n=1000 321.alb	1	0	Solution	30.04	141	90.00	36.17
instance n=1000 322.alb	1	0	Solution	30.06	140	94.00	32.86
instance n=1000 323.alb	1	0	Solution	30.04	140	90.00	35.71
instance n=1000 324.alb	1	0	Solution	30.08	142	90.00	36.62
instance n=1000 325.alb	1	0	Solution	30.06	140	89.00	36.43
instance n=1000 326.alb	1	0	Solution	30.09	561	269.00	52.05
instance n=1000 327.alb	1	0	Solution	30.14	573	279.00	51.31
instance n=1000 328.alb	1	0	Solution	30.09	558	274.00	50.90
instance n=1000 329.alb	1	0	Solution	30.12	569	275.00	51.67
instance n=1000 33.alb	1	0	Solution	30.10	561	275.00	50.98
instance n=1000 330.alb	1	0	Solution	30.14	553	271.00	50.99
instance n=1000 331.alb	1	0	Solution	30.10	559	272.00	51.34
instance n=1000 332.alb	1	0	Solution	30.11	549	269.00	51.00
instance n=1000 333.alb	1	0	Solution	30.10	569	275.00	51.67
instance n=1000 334.alb	1	0	Solution	30.11	554	272.00	50.90
instance n=1000 335.alb	1	0	Solution	30.11	555	270.00	51.35
instance n=1000 336.alb	1	0	Solution	30.11	552	270.00	51.09
instance n=1000 337.alb	1	0	Solution	30.12	570	273.00	52.11
instance n=1000 338.alb	1	0	Solution	30.11	563	274.00	51.33
instance n=1000 339.alb	1	0	Solution	30.12	566	272.00	51.94
instance n=1000 34.alb	1	0	Solution	30.12	579	276.00	52.33
instance n=1000 340.alb	1	0	Solution	30.12	575	275.00	52.17
instance n=1000 341.alb	1	0	Solution	30.10	572	274.00	52.10
instance n=1000 342.alb	1	0	Solution	30.12	567	271.00	52.20
instance n=1000 343.alb	1	0	Solution	30.14	568	273.00	51.94
instance n=1000 344.alb	1	0	Solution	30.14	563	275.00	51.15
instance n=1000 345.alb	1	0	Solution	30.11	567	275.00	51.50
instance n=1000 346.alb	1	0	Solution	30.12	562	273.00	51.42
instance n=1000 347.alb	1	0	Solution	30.10	561	270.00	51.87
instance n=1000 348.alb	1	0	Solution	30.11	578	273.00	52.77
instance n=1000 349.alb	1	0	Solution	30.11	570	277.00	51.40
instance n=1000 35.alb	1	0	Solution	30.15	563	270.00	52.04
instance n=1000 350.alb	1	0	Solution	30.18	555	269.00	51.53
instance n=1000 351.alb	1	0	Solution	30.05	232	135.00	41.81
instance n=1000 352.alb	1	0	Solution	30.05	232	137.00	40.95
instance n=1000 353.alb	1	0	Solution	30.05	221	135.00	38.91
instance n=1000 354.alb	1	0	Solution	30.06	227	136.00	40.09
instance n=1000 355.alb	1	0	Solution	30.05	224	133.00	40.63

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 356.alb	1	0	Solution	30.07	231	136.00	41.13
instance n=1000 357.alb	1	0	Solution	30.05	217	111.00	48.85
instance n=1000 358.alb	1	0	Solution	30.06	223	130.00	41.70
instance n=1000 359.alb	1	0	Solution	30.05	226	134.00	40.71
instance n=1000 36.alb	1	0	Solution	30.16	556	271.00	51.26
instance n=1000 360.alb	1	0	Solution	30.06	234	133.00	43.16
instance n=1000 361.alb	1	0	Solution	30.03	219	128.00	41.55
instance n=1000 362.alb	1	0	Solution	30.07	227	134.00	40.97
instance n=1000 363.alb	1	0	Solution	30.04	219	127.00	42.01
instance n=1000 364.alb	1	0	Solution	30.06	226	128.00	43.36
instance n=1000 365.alb	1	0	Solution	30.06	233	132.00	43.35
instance n=1000 366.alb	1	0	Solution	30.04	232	136.00	41.38
instance n=1000 367.alb	1	0	Solution	30.07	232	137.00	40.95
instance n=1000 368.alb	1	0	Solution	30.05	230	136.00	40.87
instance n=1000 369.alb	1	0	Solution	30.05	224	132.00	41.07
instance n=1000 37.alb	1	0	Solution	30.10	581	281.00	51.64
instance n=1000 370.alb	1	0	Solution	30.04	227	135.00	40.53
instance n=1000 371.alb	1	0	Solution	30.07	223	133.00	40.36
instance n=1000 372.alb	1	0	Solution	30.03	236	137.00	41.95
instance n=1000 373.alb	1	0	Solution	30.06	222	138.00	37.84
instance n=1000 374.alb	1	0	Solution	30.04	222	134.00	39.64
instance n=1000 375.alb	1	0	Solution	30.06	230	133.00	42.17
instance n=1000 376.alb	1	0	Solution	30.07	134	130.00	2.99
instance n=1000 377.alb	1	0	Solution	30.07	139	129.00	7.19
instance n=1000 378.alb	1	0	Solution	30.05	136	117.00	13.97
instance n=1000 379.alb	1	0	Solution	30.08	139	123.00	11.51
instance n=1000 38.alb	1	0	Solution	30.12	574	275.00	52.09
instance n=1000 380.alb	1	0	Solution	30.07	136	123.00	9.56
instance n=1000 381.alb	1	0	Solution	30.14	140	126.00	10.00
instance n=1000 382.alb	1	0	Solution	30.06	133	126.00	5.26
instance n=1000 383.alb	1	0	Solution	30.06	140	129.00	7.86
instance n=1000 384.alb	1	0	Solution	30.08	141	127.00	9.93
instance n=1000 385.alb	1	0	Solution	30.06	137	134.00	2.19
instance n=1000 386.alb	1	0	Solution	30.09	140	126.00	10.00
instance n=1000 387.alb	1	0	Solution	30.05	139	136.00	2.16
instance n=1000 388.alb	1	0	Solution	30.07	138	130.00	5.80
instance n=1000 389.alb	1	0	Solution	30.08	137	130.00	5.11
instance n=1000 39.alb	1	0	Solution	30.09	575	275.00	52.17
instance n=1000 390.alb	1	0	Solution	30.09	138	126.00	8.70
instance n=1000 391.alb	1	0	Solution	30.07	137	121.00	11.68
instance n=1000 392.alb	1	0	Solution	30.07	137	133.00	2.92
instance n=1000 393.alb	1	0	Solution	30.08	138	122.00	11.59
instance n=1000 394.alb	1	0	Solution	30.07	140	138.00	1.43
instance n=1000 395.alb	1	0	Solution	30.07	141	135.00	4.26

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 396.alb	1	0	Solution	30.06	138	125.00	9.42
instance n=1000 397.alb	1	0	Solution	30.06	142	127.00	10.56
instance n=1000 398.alb	1	0	Solution	30.08	136	128.00	5.88
instance n=1000 399.alb	1	0	Solution	30.08	140	125.00	10.71
instance n=1000 4.alb	1	0	Solution	30.07	140	91.00	35.00
instance n=1000 40.alb	1	0	Solution	30.09	543	271.00	50.09
instance n=1000 400.alb	1	0	Solution	30.09	142	133.00	6.34
instance n=1000 401.alb	1	0	Solution	30.16	561	369.00	34.22
instance n=1000 402.alb	1	0	Solution	30.17	569	385.00	32.34
instance n=1000 403.alb	1	0	Solution	30.15	567	361.00	36.33
instance n=1000 404.alb	1	0	Solution	30.14	566	369.00	34.81
instance n=1000 405.alb	1	0	Solution	30.15	571	392.00	31.35
instance n=1000 406.alb	1	0	Solution	30.19	552	354.00	35.87
instance n=1000 407.alb	1	0	Solution	30.15	567	361.00	36.33
instance n=1000 408.alb	1	0	Solution	30.13	571	365.00	36.08
instance n=1000 409.alb	1	0	Solution	30.13	574	372.00	35.19
instance n=1000 41.alb	1	0	Solution	30.08	568	278.00	51.06
instance n=1000 410.alb	1	0	Solution	30.16	593	388.00	34.57
instance n=1000 411.alb	1	0	Solution	30.19	569	373.00	34.45
instance n=1000 412.alb	1	0	Solution	30.15	571	360.00	36.95
instance n=1000 413.alb	1	0	Solution	30.16	568	367.00	35.39
instance n=1000 414.alb	1	0	Solution	30.16	566	362.00	36.04
instance n=1000 415.alb	1	0	Solution	30.16	571	380.00	33.45
instance n=1000 416.alb	1	0	Solution	30.19	578	366.00	36.68
instance n=1000 417.alb	1	0	Solution	30.17	594	377.00	36.53
instance n=1000 418.alb	1	0	Solution	30.06	566	392.00	30.74
instance n=1000 419.alb	1	0	Solution	30.16	592	388.00	34.46
instance n=1000 42.alb	1	0	Solution	30.12	549	267.00	51.37
instance n=1000 420.alb	1	0	Solution	30.16	565	380.00	32.74
instance n=1000 421.alb	1	0	Solution	30.15	565	354.00	37.35
instance n=1000 422.alb	1	0	Solution	30.16	562	374.00	33.45
instance n=1000 423.alb	1	0	Solution	30.14	576	355.00	38.37
instance n=1000 424.alb	1	0	Solution	30.15	555	373.00	32.79
instance n=1000 425.alb	1	0	Solution	30.15	577	368.00	36.22
instance n=1000 426.alb	1	0	Solution	30.07	229	183.00	20.09
instance n=1000 427.alb	1	0	Solution	30.07	235	183.00	22.13
instance n=1000 428.alb	1	0	Solution	30.10	228	187.00	17.98
instance n=1000 429.alb	1	0	Solution	30.09	240	192.00	20.00
instance n=1000 43.alb	1	0	Solution	30.11	552	272.00	50.72
instance n=1000 430.alb	1	0	Solution	30.10	224	172.00	23.21
instance n=1000 431.alb	1	0	Solution	30.09	235	199.00	15.32
instance n=1000 432.alb	1	0	Solution	30.08	232	183.00	21.12
instance n=1000 433.alb	1	0	Solution	30.08	234	178.00	23.93
instance n=1000 434.alb	1	0	Solution	30.07	215	175.00	18.60

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 435.alb	1	0	Solution	30.09	232	183.00	21.12
instance n=1000 436.alb	1	0	Solution	30.06	231	178.00	22.94
instance n=1000 437.alb	1	0	Solution	30.07	227	195.00	14.10
instance n=1000 438.alb	1	0	Solution	30.07	226	187.00	17.26
instance n=1000 439.alb	1	0	Solution	30.09	230	190.00	17.39
instance n=1000 44.alb	1	0	Solution	30.10	565	275.00	51.33
instance n=1000 440.alb	1	0	Solution	30.09	230	191.00	16.96
instance n=1000 441.alb	1	0	Solution	30.08	226	176.00	22.12
instance n=1000 442.alb	1	0	Solution	30.09	235	189.00	19.57
instance n=1000 443.alb	1	0	Solution	30.10	222	173.00	22.07
instance n=1000 444.alb	1	0	Solution	30.08	226	184.00	18.58
instance n=1000 445.alb	1	0	Solution	30.07	236	195.00	17.37
instance n=1000 446.alb	1	0	Solution	30.08	232	191.00	17.67
instance n=1000 447.alb	1	0	Solution	30.08	227	192.00	15.42
instance n=1000 448.alb	1	0	Solution	30.09	226	187.00	17.26
instance n=1000 449.alb	1	0	Solution	30.08	238	199.00	16.39
instance n=1000 45.alb	1	0	Solution	30.08	541	270.00	50.09
instance n=1000 450.alb	1	0	Solution	30.08	224	196.00	12.50
instance n=1000 451.alb	1	0	Solution	30.04	139	136.00	2.16
instance n=1000 452.alb	1	0	Solution	30.07	135	132.00	2.22
instance n=1000 453.alb	1	0	Solution	30.07	141	138.00	2.13
instance n=1000 454.alb	1	0	Solution	30.07	142	139.00	2.11
instance n=1000 455.alb	1	0	Solution	30.07	139	136.00	2.16
instance n=1000 456.alb	1	0	Solution	30.09	137	135.00	1.46
instance n=1000 457.alb	1	0	Solution	30.08	140	137.00	2.14
instance n=1000 458.alb	1	0	Solution	30.04	137	135.00	1.46
instance n=1000 459.alb	1	0	Solution	30.07	140	137.00	2.14
instance n=1000 46.alb	1	0	Solution	30.05	563	277.00	50.80
instance n=1000 460.alb	1	0	Solution	30.07	140	138.00	1.43
instance n=1000 461.alb	1	0	Solution	30.05	139	137.00	1.44
instance n=1000 462.alb	1	0	Solution	30.05	139	136.00	2.16
instance n=1000 463.alb	1	0	Solution	30.07	138	136.00	1.45
instance n=1000 464.alb	1	0	Solution	30.06	141	138.00	2.13
instance n=1000 465.alb	1	0	Solution	30.06	141	138.00	2.13
instance n=1000 466.alb	1	0	Solution	30.08	136	133.00	2.21
instance n=1000 467.alb	1	0	Solution	30.15	140	138.00	1.43
instance n=1000 468.alb	1	0	Solution	30.04	139	137.00	1.44
instance n=1000 469.alb	1	0	Solution	30.07	140	137.00	2.14
instance n=1000 47.alb	1	0	Solution	30.09	553	269.00	51.36
instance n=1000 470.alb	1	0	Solution	30.07	138	135.00	2.17
instance n=1000 471.alb	1	0	Solution	30.08	138	135.00	2.17
instance n=1000 472.alb	1	0	Solution	30.05	143	140.00	2.10
instance n=1000 473.alb	1	0	Solution	30.07	138	135.00	2.17
instance n=1000 474.alb	1	0	Solution	30.09	139	136.00	2.16

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 475.alb	1	0	Solution	30.06	139	136.00	2.16
instance n=1000 476.alb	1	0	Solution	30.20	590	454.00	23.05
instance n=1000 477.alb	1	0	Solution	30.18	596	468.00	21.48
instance n=1000 478.alb	1	0	Solution	30.22	605	468.00	22.64
instance n=1000 479.alb	1	0	Solution	30.27	587	451.00	23.17
instance n=1000 48.alb	1	0	Solution	30.15	584	280.00	52.05
instance n=1000 480.alb	1	0	Solution	30.17	574	459.00	20.03
instance n=1000 481.alb	1	0	Solution	30.08	587	461.00	21.47
instance n=1000 482.alb	1	0	Solution	30.21	610	449.00	26.39
instance n=1000 483.alb	1	0	Solution	30.20	582	443.00	23.88
instance n=1000 484.alb	1	0	Solution	30.23	598	465.00	22.24
instance n=1000 485.alb	1	0	Solution	30.11	596	471.00	20.97
instance n=1000 486.alb	1	0	Solution	30.17	584	456.00	21.92
instance n=1000 487.alb	1	0	Solution	30.31	597	460.00	22.95
instance n=1000 488.alb	1	0	Solution	30.09	582	463.00	20.45
instance n=1000 489.alb	1	0	Solution	30.19	577	450.00	22.01
instance n=1000 49.alb	1	0	Solution	30.11	559	275.00	50.81
instance n=1000 490.alb	1	0	Solution	30.28	583	446.00	23.50
instance n=1000 491.alb	1	0	Solution	30.20	584	459.00	21.40
instance n=1000 492.alb	1	0	Solution	30.23	604	463.00	23.34
instance n=1000 493.alb	1	0	Solution	30.17	573	451.00	21.29
instance n=1000 494.alb	1	0	Solution	30.19	587	466.00	20.61
instance n=1000 495.alb	1	0	Solution	30.25	609	469.00	22.99
instance n=1000 496.alb	1	0	Solution	30.20	572	462.00	19.23
instance n=1000 497.alb	1	0	Solution	30.25	574	453.00	21.08
instance n=1000 498.alb	1	0	Solution	30.10	592	463.00	21.79
instance n=1000 499.alb	1	0	Solution	30.20	579	456.00	21.24
instance n=1000 5.alb	1	0	Solution	30.06	136	90.00	33.82
instance n=1000 50.alb	1	0	Solution	30.08	548	271.00	50.55
instance n=1000 500.alb	1	0	Solution	30.07	593	467.00	21.25
instance n=1000 501.alb	1	0	Solution	30.07	235	227.00	3.40
instance n=1000 502.alb	1	0	Solution	30.10	231	224.00	3.03
instance n=1000 503.alb	1	0	Solution	30.18	233	224.00	3.86
instance n=1000 504.alb	1	0	Solution	30.10	235	223.00	5.11
instance n=1000 505.alb	1	0	Solution	30.08	221	213.00	3.62
instance n=1000 506.alb	1	0	Solution	30.10	230	223.00	3.04
instance n=1000 507.alb	1	0	Solution	30.06	228	220.00	3.51
instance n=1000 508.alb	1	0	Solution	30.07	226	219.00	3.10
instance n=1000 509.alb	1	0	Solution	30.08	232	225.00	3.02
instance n=1000 51.alb	1	0	Solution	30.05	231	134.00	41.99
instance n=1000 510.alb	1	0	Solution	30.07	234	226.00	3.42
instance n=1000 511.alb	1	0	Solution	30.10	239	229.00	4.18
instance n=1000 512.alb	1	0	Solution	30.11	226	219.00	3.10
instance n=1000 513.alb	1	0	Solution	30.06	226	219.00	3.10

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 514.alb	1	0	Solution	30.08	234	223.00	4.70
instance n=1000 515.alb	1	0	Solution	30.09	229	217.00	5.24
instance n=1000 516.alb	1	0	Solution	30.06	237	229.00	3.38
instance n=1000 517.alb	1	0	Solution	30.12	228	218.00	4.39
instance n=1000 518.alb	1	0	Solution	30.10	227	216.00	4.85
instance n=1000 519.alb	1	0	Solution	30.06	229	221.00	3.49
instance n=1000 52.alb	1	0	Solution	30.08	233	137.00	41.20
instance n=1000 520.alb	1	0	Solution	30.09	232	226.00	2.59
instance n=1000 521.alb	1	0	Solution	30.07	238	223.00	6.30
instance n=1000 522.alb	1	0	Solution	30.07	222	215.00	3.15
instance n=1000 523.alb	1	0	Solution	30.09	228	219.00	3.95
instance n=1000 524.alb	1	0	Solution	30.09	234	221.00	5.56
instance n=1000 525.alb	1	0	Solution	30.06	228	221.00	3.07
instance n=1000 53.alb	1	0	Solution	30.04	231	138.00	40.26
instance n=1000 54.alb	1	0	Solution	30.06	224	138.00	38.39
instance n=1000 55.alb	1	0	Solution	30.04	222	131.00	40.99
instance n=1000 56.alb	1	0	Solution	30.05	232	135.00	41.81
instance n=1000 57.alb	1	0	Solution	30.03	228	134.00	41.23
instance n=1000 58.alb	1	0	Solution	30.05	227	137.00	39.65
instance n=1000 59.alb	1	0	Solution	30.06	226	134.00	40.71
instance n=1000 6.alb	1	0	Solution	30.04	143	91.00	36.36
instance n=1000 60.alb	1	0	Solution	30.05	234	135.00	42.31
instance n=1000 61.alb	1	0	Solution	30.06	234	135.00	42.31
instance n=1000 62.alb	1	0	Solution	30.04	228	134.00	41.23
instance n=1000 63.alb	1	0	Solution	30.07	230	137.00	40.43
instance n=1000 64.alb	1	0	Solution	30.11	234	136.00	41.88
instance n=1000 65.alb	1	0	Solution	30.06	229	133.00	41.92
instance n=1000 66.alb	1	0	Solution	30.04	231	133.00	42.42
instance n=1000 67.alb	1	0	Solution	30.06	227	129.00	43.17
instance n=1000 68.alb	1	0	Solution	30.03	231	135.00	41.56
instance n=1000 69.alb	1	0	Solution	30.05	227	132.00	41.85
instance n=1000 7.alb	1	0	Solution	30.05	138	88.00	36.23
instance n=1000 70.alb	1	0	Solution	30.03	232	138.00	40.52
instance n=1000 71.alb	1	0	Solution	30.04	234	137.00	41.45
instance n=1000 72.alb	1	0	Solution	30.05	226	134.00	40.71
instance n=1000 73.alb	1	0	Solution	30.04	225	133.00	40.89
instance n=1000 74.alb	1	0	Solution	30.06	231	132.00	42.86
instance n=1000 75.alb	1	0	Solution	30.04	231	136.00	41.13
instance n=1000 76.alb	1	0	Solution	30.06	137	136.00	0.73
instance n=1000 77.alb	1	0	Solution	30.08	137	136.00	0.73
instance n=1000 78.alb	1	0	Solution	30.06	140	138.00	1.43
instance n=1000 79.alb	1	0	Solution	30.08	143	142.00	0.70
instance n=1000 8.alb	1	0	Solution	30.06	140	87.00	37.86
instance n=1000 80.alb	1	0	Solution	30.07	142	140.00	1.41

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 81.alb	1	0	Solution	30.08	138	135.00	2.17
instance n=1000 82.alb	1	0	Solution	30.09	137	136.00	0.73
instance n=1000 83.alb	1	0	Solution	30.08	141	139.00	1.42
instance n=1000 84.alb	1	0	Solution	30.05	136	135.00	0.74
instance n=1000 85.alb	1	0	Solution	30.07	137	136.00	0.73
instance n=1000 86.alb	1	0	Solution	30.08	139	138.00	0.72
instance n=1000 87.alb	1	0	Solution	30.07	142	140.00	1.41
instance n=1000 88.alb	1	0	Solution	30.08	142	140.00	1.41
instance n=1000 89.alb	1	0	Solution	30.06	142	140.00	1.41
instance n=1000 9.alb	1	0	Solution	30.04	136	90.00	33.82
instance n=1000 90.alb	1	0	Solution	30.07	139	138.00	0.72
instance n=1000 91.alb	1	0	Solution	30.07	142	141.00	0.70
instance n=1000 92.alb	1	0	Solution	30.07	137	136.00	0.73
instance n=1000 93.alb	1	0	Solution	30.08	138	135.00	2.17
instance n=1000 94.alb	1	0	Solution	30.09	139	137.00	1.44
instance n=1000 95.alb	1	0	Solution	30.08	137	136.00	0.73
instance n=1000 96.alb	1	0	Solution	30.08	139	137.00	1.44
instance n=1000 97.alb	1	0	Solution	30.08	140	138.00	1.43
instance n=1000 98.alb	1	0	Solution	30.06	137	136.00	0.73
instance n=1000 99.alb	1	0	Solution	30.07	137	136.00	0.73
instance n=100 1.alb	1	0	Optimal	12.69	23	23.00	0.00
instance n=100 10.alb	1	0	Optimal	1.11	22	22.00	0.00
instance n=100 100.alb	1	0	Optimal	3.60	25	25.00	0.00
instance n=100 101.alb	1	0	Optimal	24.49	15	15.00	0.00
instance n=100 102.alb	1	0	Optimal	0.14	14	14.00	0.00
instance n=100 103.alb	1	0	Optimal	0.12	14	14.00	0.00
instance n=100 104.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 105.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=100 106.alb	1	0	Optimal	0.12	14	14.00	0.00
instance n=100 107.alb	1	0	Optimal	0.10	14	14.00	0.00
instance n=100 108.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 109.alb	1	0	Optimal	0.22	15	15.00	0.00
instance n=100 11.alb	1	0	Optimal	0.63	24	24.00	0.00
instance n=100 110.alb	1	0	Optimal	0.12	13	13.00	0.00
instance n=100 111.alb	1	0	Optimal	3.74	16	16.00	0.00
instance n=100 112.alb	1	0	Optimal	30.02	13	13.00	0.00
instance n=100 113.alb	1	0	Optimal	1.09	14	14.00	0.00
instance n=100 114.alb	1	0	Optimal	0.59	13	13.00	0.00
instance n=100 115.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 116.alb	1	0	Optimal	3.14	16	16.00	0.00
instance n=100 117.alb	1	0	Optimal	30.01	15	15.00	0.00
instance n=100 118.alb	1	0	Optimal	0.06	15	15.00	0.00
instance n=100 119.alb	1	0	Optimal	0.10	14	14.00	0.00
instance n=100 12.alb	1	0	Optimal	30.03	25	25.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 120.alb	1	0	Optimal	0.13	14	14.00	0.00
instance n=100 121.alb	1	0	Optimal	0.43	15	15.00	0.00
instance n=100 122.alb	1	0	Optimal	0.25	13	13.00	0.00
instance n=100 123.alb	1	0	Optimal	30.02	15	15.00	0.00
instance n=100 124.alb	1	0	Optimal	30.01	15	15.00	0.00
instance n=100 125.alb	1	0	Optimal	0.11	14	14.00	0.00
instance n=100 126.alb	1	0	Solution	30.08	51	50.00	1.96
instance n=100 127.alb	1	0	Solution	30.12	52	50.00	3.85
instance n=100 128.alb	1	0	Solution	30.09	57	56.00	1.75
instance n=100 129.alb	1	0	Optimal	0.97	54	54.00	0.00
instance n=100 13.alb	1	0	Optimal	0.50	24	24.00	0.00
instance n=100 130.alb	1	0	Solution	30.06	55	52.00	5.45
instance n=100 131.alb	1	0	Solution	30.06	53	51.00	3.77
instance n=100 132.alb	1	0	Solution	30.06	58	56.00	3.45
instance n=100 133.alb	1	0	Solution	30.07	55	53.00	3.64
instance n=100 134.alb	1	0	Solution	30.05	55	52.00	5.45
instance n=100 135.alb	1	0	Solution	30.04	55	53.00	3.64
instance n=100 136.alb	1	0	Solution	30.15	52	50.00	3.85
instance n=100 137.alb	1	0	Solution	30.10	54	51.00	5.56
instance n=100 138.alb	1	0	Optimal	30.02	56	56.00	0.00
instance n=100 139.alb	1	0	Solution	30.07	52	51.00	1.92
instance n=100 14.alb	1	0	Optimal	30.01	20	20.00	0.00
instance n=100 140.alb	1	0	Solution	30.17	55	54.00	1.82
instance n=100 141.alb	1	0	Solution	30.07	51	49.00	3.92
instance n=100 142.alb	1	0	Solution	30.04	55	52.00	5.45
instance n=100 143.alb	1	0	Solution	30.08	53	51.00	3.77
instance n=100 144.alb	1	0	Solution	30.04	49	47.00	4.08
instance n=100 145.alb	1	0	Solution	30.05	56	53.00	5.36
instance n=100 146.alb	1	0	Optimal	3.68	53	53.00	0.00
instance n=100 147.alb	1	0	Solution	30.05	59	58.00	1.69
instance n=100 148.alb	1	0	Solution	30.04	52	50.00	3.85
instance n=100 149.alb	1	0	Solution	30.06	55	54.00	1.82
instance n=100 15.alb	1	0	Optimal	0.08	24	24.00	0.00
instance n=100 150.alb	1	0	Solution	30.05	57	54.00	5.26
instance n=100 151.alb	1	0	Solution	30.15	22	21.00	4.55
instance n=100 152.alb	1	0	Optimal	0.57	22	22.00	0.00
instance n=100 153.alb	1	0	Optimal	0.35	21	21.00	0.00
instance n=100 154.alb	1	0	Optimal	0.11	25	25.00	0.00
instance n=100 155.alb	1	0	Optimal	0.31	22	22.00	0.00
instance n=100 156.alb	1	0	Optimal	0.59	23	23.00	0.00
instance n=100 157.alb	1	0	Optimal	0.39	26	26.00	0.00
instance n=100 158.alb	1	0	Optimal	22.99	23	23.00	0.00
instance n=100 159.alb	1	0	Optimal	0.14	19	19.00	0.00
instance n=100 16.alb	1	0	Optimal	30.01	23	23.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 160.alb	1	0	Optimal	0.45	22	22.00	0.00
instance n=100 161.alb	1	0	Solution	30.04	23	22.00	4.35
instance n=100 162.alb	1	0	Solution	30.04	23	22.00	4.35
instance n=100 163.alb	1	0	Optimal	0.13	25	25.00	0.00
instance n=100 164.alb	1	0	Optimal	0.11	23	23.00	0.00
instance n=100 165.alb	1	0	Solution	30.04	25	24.00	4.00
instance n=100 166.alb	1	0	Optimal	0.59	24	24.00	0.00
instance n=100 167.alb	1	0	Optimal	0.30	22	22.00	0.00
instance n=100 168.alb	1	0	Solution	30.04	22	21.00	4.55
instance n=100 169.alb	1	0	Optimal	0.63	21	21.00	0.00
instance n=100 17.alb	1	0	Solution	30.09	22	21.00	4.55
instance n=100 170.alb	1	0	Optimal	30.02	24	24.00	0.00
instance n=100 171.alb	1	0	Solution	30.06	25	24.00	4.00
instance n=100 172.alb	1	0	Optimal	0.31	24	24.00	0.00
instance n=100 173.alb	1	0	Solution	30.10	25	24.00	4.00
instance n=100 174.alb	1	0	Solution	30.04	23	22.00	4.35
instance n=100 175.alb	1	0	Solution	30.06	27	26.00	3.70
instance n=100 176.alb	1	0	Optimal	0.12	13	13.00	0.00
instance n=100 177.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 178.alb	1	0	Optimal	30.01	15	15.00	0.00
instance n=100 179.alb	1	0	Optimal	3.65	15	15.00	0.00
instance n=100 18.alb	1	0	Solution	30.05	20	19.00	5.00
instance n=100 180.alb	1	0	Optimal	0.10	15	15.00	0.00
instance n=100 181.alb	1	0	Optimal	30.02	13	13.00	0.00
instance n=100 182.alb	1	0	Optimal	0.11	15	15.00	0.00
instance n=100 183.alb	1	0	Optimal	0.06	14	14.00	0.00
instance n=100 184.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 185.alb	1	0	Optimal	30.01	15	15.00	0.00
instance n=100 186.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 187.alb	1	0	Solution	30.05	14	13.00	7.14
instance n=100 188.alb	1	0	Optimal	0.12	16	16.00	0.00
instance n=100 189.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 19.alb	1	0	Optimal	0.60	23	23.00	0.00
instance n=100 190.alb	1	0	Optimal	0.44	13	13.00	0.00
instance n=100 191.alb	1	0	Optimal	0.06	14	14.00	0.00
instance n=100 192.alb	1	0	Optimal	30.01	13	13.00	0.00
instance n=100 193.alb	1	0	Optimal	3.19	15	15.00	0.00
instance n=100 194.alb	1	0	Optimal	30.02	15	15.00	0.00
instance n=100 195.alb	1	0	Optimal	14.58	15	15.00	0.00
instance n=100 196.alb	1	0	Optimal	30.02	15	15.00	0.00
instance n=100 197.alb	1	0	Optimal	0.07	15	15.00	0.00
instance n=100 198.alb	1	0	Optimal	1.22	13	13.00	0.00
instance n=100 199.alb	1	0	Optimal	0.08	14	14.00	0.00
instance n=100 2.alb	1	0	Optimal	0.37	21	21.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 20.alb	1	0	Optimal	30.02	21	21.00	0.00
instance n=100 200.alb	1	0	Optimal	8.95	15	15.00	0.00
instance n=100 201.alb	1	0	Solution	30.06	54	52.00	3.70
instance n=100 202.alb	1	0	Optimal	30.03	61	61.00	0.00
instance n=100 203.alb	1	0	Solution	30.11	53	52.00	1.89
instance n=100 204.alb	1	0	Solution	30.10	51	49.00	3.92
instance n=100 205.alb	1	0	Optimal	30.02	56	56.00	0.00
instance n=100 206.alb	1	0	Solution	30.04	52	50.00	3.85
instance n=100 207.alb	1	0	Solution	30.21	52	50.00	3.85
instance n=100 208.alb	1	0	Solution	30.06	57	56.00	1.75
instance n=100 209.alb	1	0	Solution	30.04	56	54.00	3.57
instance n=100 21.alb	1	0	Optimal	0.61	21	21.00	0.00
instance n=100 210.alb	1	0	Solution	30.05	52	51.00	1.92
instance n=100 211.alb	1	0	Solution	30.06	52	51.00	1.92
instance n=100 212.alb	1	0	Solution	30.06	52	51.00	1.92
instance n=100 213.alb	1	0	Solution	30.06	53	51.00	3.77
instance n=100 214.alb	1	0	Solution	30.09	55	53.00	3.64
instance n=100 215.alb	1	0	Solution	30.05	50	48.00	4.00
instance n=100 216.alb	1	0	Solution	30.05	52	51.00	1.92
instance n=100 217.alb	1	0	Solution	30.04	52	51.00	1.92
instance n=100 218.alb	1	0	Solution	30.06	53	52.00	1.89
instance n=100 219.alb	1	0	Solution	30.06	52	51.00	1.92
instance n=100 22.alb	1	0	Solution	30.04	25	24.00	4.00
instance n=100 220.alb	1	0	Solution	30.07	53	52.00	1.89
instance n=100 221.alb	1	0	Solution	30.04	57	56.00	1.75
instance n=100 222.alb	1	0	Solution	30.05	53	51.00	3.77
instance n=100 223.alb	1	0	Solution	30.10	52	50.00	3.85
instance n=100 224.alb	1	0	Solution	30.06	56	55.00	1.79
instance n=100 225.alb	1	0	Solution	30.08	54	52.00	3.70
instance n=100 226.alb	1	0	Solution	30.04	25	24.00	4.00
instance n=100 227.alb	1	0	Solution	30.04	27	26.00	3.70
instance n=100 228.alb	1	0	Optimal	2.42	22	22.00	0.00
instance n=100 229.alb	1	0	Optimal	1.07	24	24.00	0.00
instance n=100 23.alb	1	0	Optimal	0.16	24	24.00	0.00
instance n=100 230.alb	1	0	Solution	30.11	24	23.00	4.17
instance n=100 231.alb	1	0	Optimal	0.85	22	22.00	0.00
instance n=100 232.alb	1	0	Optimal	18.87	22	22.00	0.00
instance n=100 233.alb	1	0	Solution	30.03	23	22.00	4.35
instance n=100 234.alb	1	0	Optimal	0.48	23	23.00	0.00
instance n=100 235.alb	1	0	Optimal	24.69	26	26.00	0.00
instance n=100 236.alb	1	0	Solution	30.07	23	22.00	4.35
instance n=100 237.alb	1	0	Optimal	0.45	23	23.00	0.00
instance n=100 238.alb	1	0	Optimal	4.14	23	23.00	0.00
instance n=100 239.alb	1	0	Optimal	15.11	21	21.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 24.alb	1	0	Optimal	1.18	24	24.00	0.00
instance n=100 240.alb	1	0	Optimal	2.01	22	22.00	0.00
instance n=100 241.alb	1	0	Optimal	16.77	22	22.00	0.00
instance n=100 242.alb	1	0	Optimal	1.90	23	23.00	0.00
instance n=100 243.alb	1	0	Solution	30.05	24	23.00	4.17
instance n=100 244.alb	1	0	Optimal	0.27	21	21.00	0.00
instance n=100 245.alb	1	0	Solution	30.02	24	23.00	4.17
instance n=100 246.alb	1	0	Optimal	1.37	26	26.00	0.00
instance n=100 247.alb	1	0	Optimal	15.11	22	22.00	0.00
instance n=100 248.alb	1	0	Optimal	10.46	19	19.00	0.00
instance n=100 249.alb	1	0	Optimal	0.60	21	21.00	0.00
instance n=100 25.alb	1	0	Optimal	30.01	22	22.00	0.00
instance n=100 250.alb	1	0	Optimal	0.54	24	24.00	0.00
instance n=100 251.alb	1	0	Optimal	0.11	15	15.00	0.00
instance n=100 252.alb	1	0	Optimal	0.46	14	14.00	0.00
instance n=100 253.alb	1	0	Optimal	0.40	14	14.00	0.00
instance n=100 254.alb	1	0	Optimal	0.09	14	14.00	0.00
instance n=100 255.alb	1	0	Optimal	0.10	14	14.00	0.00
instance n=100 256.alb	1	0	Optimal	30.02	15	15.00	0.00
instance n=100 257.alb	1	0	Optimal	30.01	12	12.00	0.00
instance n=100 258.alb	1	0	Optimal	24.13	14	14.00	0.00
instance n=100 259.alb	1	0	Optimal	0.80	15	15.00	0.00
instance n=100 26.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 260.alb	1	0	Optimal	0.12	15	15.00	0.00
instance n=100 261.alb	1	0	Optimal	0.10	14	14.00	0.00
instance n=100 262.alb	1	0	Optimal	0.12	14	14.00	0.00
instance n=100 263.alb	1	0	Optimal	0.12	14	14.00	0.00
instance n=100 264.alb	1	0	Optimal	30.02	15	15.00	0.00
instance n=100 265.alb	1	0	Optimal	15.18	14	14.00	0.00
instance n=100 266.alb	1	0	Optimal	5.12	13	13.00	0.00
instance n=100 267.alb	1	0	Optimal	14.54	13	13.00	0.00
instance n=100 268.alb	1	0	Optimal	0.11	15	15.00	0.00
instance n=100 269.alb	1	0	Optimal	0.10	15	15.00	0.00
instance n=100 27.alb	1	0	Optimal	30.01	13	13.00	0.00
instance n=100 270.alb	1	0	Optimal	0.11	13	13.00	0.00
instance n=100 271.alb	1	0	Optimal	26.99	13	13.00	0.00
instance n=100 272.alb	1	0	Optimal	0.11	14	14.00	0.00
instance n=100 273.alb	1	0	Optimal	1.81	13	13.00	0.00
instance n=100 274.alb	1	0	Optimal	5.35	13	13.00	0.00
instance n=100 275.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=100 276.alb	1	0	Solution	30.05	61	58.00	4.92
instance n=100 277.alb	1	0	Solution	30.07	58	54.00	6.90
instance n=100 278.alb	1	0	Solution	30.07	58	55.00	5.17
instance n=100 279.alb	1	0	Solution	30.07	54	52.00	3.70

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 28.alb	1	0	Optimal	29.67	14	14.00	0.00
instance n=100 280.alb	1	0	Solution	30.13	55	51.00	7.27
instance n=100 281.alb	1	0	Solution	30.05	62	60.00	3.23
instance n=100 282.alb	1	0	Solution	30.05	60	57.00	5.00
instance n=100 283.alb	1	0	Solution	30.05	55	53.00	3.64
instance n=100 284.alb	1	0	Solution	30.05	55	54.00	1.82
instance n=100 285.alb	1	0	Solution	30.06	55	52.00	5.45
instance n=100 286.alb	1	0	Solution	30.05	57	55.00	3.51
instance n=100 287.alb	1	0	Optimal	3.55	54	54.00	0.00
instance n=100 288.alb	1	0	Solution	30.14	56	53.00	5.36
instance n=100 289.alb	1	0	Solution	30.05	62	61.00	1.61
instance n=100 29.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 290.alb	1	0	Solution	30.07	55	52.00	5.45
instance n=100 291.alb	1	0	Solution	30.03	52	49.00	5.77
instance n=100 292.alb	1	0	Solution	30.10	57	55.00	3.51
instance n=100 293.alb	1	0	Solution	30.06	53	50.00	5.66
instance n=100 294.alb	1	0	Solution	30.19	58	54.00	6.90
instance n=100 295.alb	1	0	Solution	30.06	57	55.00	3.51
instance n=100 296.alb	1	0	Solution	30.05	55	53.00	3.64
instance n=100 297.alb	1	0	Optimal	30.02	58	58.00	0.00
instance n=100 298.alb	1	0	Solution	30.05	59	57.00	3.39
instance n=100 299.alb	1	0	Optimal	30.03	54	54.00	0.00
instance n=100 3.alb	1	0	Optimal	0.42	20	20.00	0.00
instance n=100 30.alb	1	0	Optimal	0.11	15	15.00	0.00
instance n=100 300.alb	1	0	Solution	30.06	55	51.00	7.27
instance n=100 301.alb	1	0	Optimal	30.02	23	23.00	0.00
instance n=100 302.alb	1	0	Optimal	0.11	24	24.00	0.00
instance n=100 303.alb	1	0	Optimal	1.44	24	24.00	0.00
instance n=100 304.alb	1	0	Optimal	0.11	21	21.00	0.00
instance n=100 305.alb	1	0	Optimal	0.92	22	22.00	0.00
instance n=100 306.alb	1	0	Optimal	0.38	24	24.00	0.00
instance n=100 307.alb	1	0	Solution	30.09	24	23.00	4.17
instance n=100 308.alb	1	0	Solution	30.05	21	20.00	4.76
instance n=100 309.alb	1	0	Solution	30.34	22	21.00	4.55
instance n=100 31.alb	1	0	Optimal	0.25	14	14.00	0.00
instance n=100 310.alb	1	0	Optimal	0.15	23	23.00	0.00
instance n=100 311.alb	1	0	Optimal	9.29	21	21.00	0.00
instance n=100 312.alb	1	0	Optimal	15.38	22	22.00	0.00
instance n=100 313.alb	1	0	Optimal	30.02	23	23.00	0.00
instance n=100 314.alb	1	0	Optimal	0.79	19	19.00	0.00
instance n=100 315.alb	1	0	Optimal	30.03	22	22.00	0.00
instance n=100 316.alb	1	0	Optimal	30.02	24	24.00	0.00
instance n=100 317.alb	1	0	Optimal	30.01	26	26.00	0.00
instance n=100 318.alb	1	0	Optimal	0.22	21	21.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 319.alb	1	0	Optimal	0.41	23	23.00	0.00
instance n=100 32.alb	1	0	Optimal	0.07	14	14.00	0.00
instance n=100 320.alb	1	0	Optimal	0.10	22	22.00	0.00
instance n=100 321.alb	1	0	Optimal	3.15	26	26.00	0.00
instance n=100 322.alb	1	0	Solution	30.07	24	23.00	4.17
instance n=100 323.alb	1	0	Optimal	9.38	24	24.00	0.00
instance n=100 324.alb	1	0	Optimal	0.51	23	23.00	0.00
instance n=100 325.alb	1	0	Optimal	30.01	25	25.00	0.00
instance n=100 326.alb	1	0	Optimal	22.36	13	13.00	0.00
instance n=100 327.alb	1	0	Optimal	4.20	14	14.00	0.00
instance n=100 328.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 329.alb	1	0	Optimal	0.22	14	14.00	0.00
instance n=100 33.alb	1	0	Optimal	0.14	15	15.00	0.00
instance n=100 330.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 331.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 332.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 333.alb	1	0	Optimal	30.02	15	15.00	0.00
instance n=100 334.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 335.alb	1	0	Optimal	30.00	13	13.00	0.00
instance n=100 336.alb	1	0	Optimal	30.02	15	15.00	0.00
instance n=100 337.alb	1	0	Optimal	30.01	13	13.00	0.00
instance n=100 338.alb	1	0	Solution	30.04	15	14.00	6.67
instance n=100 339.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 34.alb	1	0	Optimal	0.05	15	15.00	0.00
instance n=100 340.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 341.alb	1	0	Optimal	30.02	16	16.00	0.00
instance n=100 342.alb	1	0	Optimal	0.48	14	14.00	0.00
instance n=100 343.alb	1	0	Optimal	1.31	16	16.00	0.00
instance n=100 344.alb	1	0	Optimal	30.02	15	15.00	0.00
instance n=100 345.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 346.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 347.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 348.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 349.alb	1	0	Optimal	30.01	13	13.00	0.00
instance n=100 35.alb	1	0	Optimal	2.54	15	15.00	0.00
instance n=100 350.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 351.alb	1	0	Solution	30.03	59	58.00	1.69
instance n=100 352.alb	1	0	Optimal	0.17	63	63.00	0.00
instance n=100 353.alb	1	0	Solution	30.09	51	50.00	1.96
instance n=100 354.alb	1	0	Solution	30.08	52	51.00	1.92
instance n=100 355.alb	1	0	Solution	30.06	55	53.00	3.64
instance n=100 356.alb	1	0	Optimal	30.02	59	59.00	0.00
instance n=100 357.alb	1	0	Optimal	30.03	53	53.00	0.00
instance n=100 358.alb	1	0	Solution	30.04	52	51.00	1.92

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 359.alb	1	0	Solution	30.07	53	52.00	1.89
instance n=100 36.alb	1	0	Solution	30.06	15	14.00	6.67
instance n=100 360.alb	1	0	Optimal	30.03	54	54.00	0.00
instance n=100 361.alb	1	0	Solution	30.05	52	50.00	3.85
instance n=100 362.alb	1	0	Optimal	30.02	57	57.00	0.00
instance n=100 363.alb	1	0	Solution	30.04	52	51.00	1.92
instance n=100 364.alb	1	0	Solution	30.08	52	51.00	1.92
instance n=100 365.alb	1	0	Solution	30.06	53	52.00	1.89
instance n=100 366.alb	1	0	Optimal	30.02	61	61.00	0.00
instance n=100 367.alb	1	0	Optimal	30.04	55	55.00	0.00
instance n=100 368.alb	1	0	Solution	30.05	59	58.00	1.69
instance n=100 369.alb	1	0	Solution	30.05	51	50.00	1.96
instance n=100 37.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 370.alb	1	0	Solution	30.05	57	56.00	1.75
instance n=100 371.alb	1	0	Solution	30.04	53	51.00	3.77
instance n=100 372.alb	1	0	Solution	30.07	49	48.00	2.04
instance n=100 373.alb	1	0	Solution	30.03	51	50.00	1.96
instance n=100 374.alb	1	0	Solution	30.06	52	51.00	1.92
instance n=100 375.alb	1	0	Optimal	30.03	57	57.00	0.00
instance n=100 376.alb	1	0	Optimal	0.46	23	23.00	0.00
instance n=100 377.alb	1	0	Solution	30.05	21	20.00	4.76
instance n=100 378.alb	1	0	Optimal	6.77	22	22.00	0.00
instance n=100 379.alb	1	0	Optimal	5.39	23	23.00	0.00
instance n=100 38.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 380.alb	1	0	Solution	30.04	23	22.00	4.35
instance n=100 381.alb	1	0	Optimal	3.54	24	24.00	0.00
instance n=100 382.alb	1	0	Optimal	5.84	25	25.00	0.00
instance n=100 383.alb	1	0	Optimal	0.24	25	25.00	0.00
instance n=100 384.alb	1	0	Optimal	0.48	25	25.00	0.00
instance n=100 385.alb	1	0	Optimal	0.45	22	22.00	0.00
instance n=100 386.alb	1	0	Solution	30.04	24	23.00	4.17
instance n=100 387.alb	1	0	Optimal	0.59	22	22.00	0.00
instance n=100 388.alb	1	0	Solution	30.16	26	25.00	3.85
instance n=100 389.alb	1	0	Optimal	0.12	23	23.00	0.00
instance n=100 39.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 390.alb	1	0	Solution	30.05	23	22.00	4.35
instance n=100 391.alb	1	0	Optimal	0.42	20	20.00	0.00
instance n=100 392.alb	1	0	Optimal	0.13	22	22.00	0.00
instance n=100 393.alb	1	0	Solution	30.04	24	23.00	4.17
instance n=100 394.alb	1	0	Optimal	0.58	22	22.00	0.00
instance n=100 395.alb	1	0	Optimal	11.21	24	24.00	0.00
instance n=100 396.alb	1	0	Optimal	30.02	20	20.00	0.00
instance n=100 397.alb	1	0	Solution	30.04	26	25.00	3.85
instance n=100 398.alb	1	0	Optimal	25.32	25	25.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 399.alb	1	0	Optimal	0.48	23	23.00	0.00
instance n=100 4.alb	1	0	Optimal	12.93	24	24.00	0.00
instance n=100 40.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 400.alb	1	0	Optimal	1.52	24	24.00	0.00
instance n=100 401.alb	1	0	Optimal	0.36	15	15.00	0.00
instance n=100 402.alb	1	0	Optimal	0.45	15	15.00	0.00
instance n=100 403.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 404.alb	1	0	Optimal	0.11	15	15.00	0.00
instance n=100 405.alb	1	0	Optimal	0.10	13	13.00	0.00
instance n=100 406.alb	1	0	Optimal	0.11	14	14.00	0.00
instance n=100 407.alb	1	0	Optimal	0.09	15	15.00	0.00
instance n=100 408.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 409.alb	1	0	Optimal	0.57	15	15.00	0.00
instance n=100 41.alb	1	0	Optimal	30.01	13	13.00	0.00
instance n=100 410.alb	1	0	Optimal	0.39	14	14.00	0.00
instance n=100 411.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 412.alb	1	0	Optimal	0.11	14	14.00	0.00
instance n=100 413.alb	1	0	Optimal	0.10	14	14.00	0.00
instance n=100 414.alb	1	0	Solution	30.03	15	14.00	6.67
instance n=100 415.alb	1	0	Optimal	0.73	13	13.00	0.00
instance n=100 416.alb	1	0	Optimal	0.15	14	14.00	0.00
instance n=100 417.alb	1	0	Optimal	0.11	15	15.00	0.00
instance n=100 418.alb	1	0	Optimal	0.11	16	16.00	0.00
instance n=100 419.alb	1	0	Optimal	0.73	14	14.00	0.00
instance n=100 42.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 420.alb	1	0	Optimal	0.11	14	14.00	0.00
instance n=100 421.alb	1	0	Optimal	0.57	14	14.00	0.00
instance n=100 422.alb	1	0	Optimal	1.16	15	15.00	0.00
instance n=100 423.alb	1	0	Optimal	0.97	14	14.00	0.00
instance n=100 424.alb	1	0	Optimal	0.27	14	14.00	0.00
instance n=100 425.alb	1	0	Optimal	1.72	15	15.00	0.00
instance n=100 426.alb	1	0	Solution	30.03	61	58.00	4.92
instance n=100 427.alb	1	0	Solution	30.06	56	54.00	3.57
instance n=100 428.alb	1	0	Solution	30.06	55	54.00	1.82
instance n=100 429.alb	1	0	Solution	30.24	58	57.00	1.72
instance n=100 43.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 430.alb	1	0	Solution	30.05	53	52.00	1.89
instance n=100 431.alb	1	0	Solution	30.12	55	52.00	5.45
instance n=100 432.alb	1	0	Solution	30.08	56	54.00	3.57
instance n=100 433.alb	1	0	Optimal	30.03	52	52.00	0.00
instance n=100 434.alb	1	0	Solution	30.10	57	55.00	3.51
instance n=100 435.alb	1	0	Solution	30.06	56	52.00	7.14
instance n=100 436.alb	1	0	Solution	30.04	52	49.00	5.77
instance n=100 437.alb	1	0	Solution	30.06	53	51.00	3.77

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 438.alb	1	0	Solution	30.09	55	52.00	5.45
instance n=100 439.alb	1	0	Solution	30.07	55	54.00	1.82
instance n=100 44.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 440.alb	1	0	Solution	30.12	54	51.00	5.56
instance n=100 441.alb	1	0	Solution	30.05	53	51.00	3.77
instance n=100 442.alb	1	0	Solution	30.06	52	49.00	5.77
instance n=100 443.alb	1	0	Solution	30.05	55	53.00	3.64
instance n=100 444.alb	1	0	Solution	30.09	54	50.00	7.41
instance n=100 445.alb	1	0	Solution	30.07	56	54.00	3.57
instance n=100 446.alb	1	0	Solution	30.18	57	54.00	5.26
instance n=100 447.alb	1	0	Solution	30.11	54	52.00	3.70
instance n=100 448.alb	1	0	Solution	30.05	56	54.00	3.57
instance n=100 449.alb	1	0	Solution	30.05	55	52.00	5.45
instance n=100 45.alb	1	0	Optimal	30.02	14	14.00	0.00
instance n=100 450.alb	1	0	Solution	30.09	54	52.00	3.70
instance n=100 451.alb	1	0	Optimal	0.08	26	26.00	0.00
instance n=100 452.alb	1	0	Optimal	0.53	22	22.00	0.00
instance n=100 453.alb	1	0	Optimal	0.45	24	24.00	0.00
instance n=100 454.alb	1	0	Optimal	0.12	23	23.00	0.00
instance n=100 455.alb	1	0	Optimal	0.40	23	23.00	0.00
instance n=100 456.alb	1	0	Optimal	0.38	26	26.00	0.00
instance n=100 457.alb	1	0	Optimal	0.18	23	23.00	0.00
instance n=100 458.alb	1	0	Optimal	0.23	24	24.00	0.00
instance n=100 459.alb	1	0	Optimal	0.37	23	23.00	0.00
instance n=100 46.alb	1	0	Optimal	3.48	14	14.00	0.00
instance n=100 460.alb	1	0	Optimal	0.10	23	23.00	0.00
instance n=100 461.alb	1	0	Optimal	1.07	23	23.00	0.00
instance n=100 462.alb	1	0	Optimal	0.21	23	23.00	0.00
instance n=100 463.alb	1	0	Optimal	0.98	26	26.00	0.00
instance n=100 464.alb	1	0	Optimal	0.24	25	25.00	0.00
instance n=100 465.alb	1	0	Optimal	0.46	22	22.00	0.00
instance n=100 466.alb	1	0	Optimal	0.29	26	26.00	0.00
instance n=100 467.alb	1	0	Optimal	1.37	21	21.00	0.00
instance n=100 468.alb	1	0	Optimal	0.47	25	25.00	0.00
instance n=100 469.alb	1	0	Optimal	0.16	22	22.00	0.00
instance n=100 47.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 470.alb	1	0	Optimal	1.36	26	26.00	0.00
instance n=100 471.alb	1	0	Optimal	0.55	26	26.00	0.00
instance n=100 472.alb	1	0	Optimal	0.14	23	23.00	0.00
instance n=100 473.alb	1	0	Optimal	0.40	28	28.00	0.00
instance n=100 474.alb	1	0	Optimal	0.36	23	23.00	0.00
instance n=100 475.alb	1	0	Optimal	1.15	24	24.00	0.00
instance n=100 476.alb	1	0	Optimal	0.12	14	14.00	0.00
instance n=100 477.alb	1	0	Optimal	0.11	14	14.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 478.alb	1	0	Optimal	0.12	14	14.00	0.00
instance n=100 479.alb	1	0	Optimal	0.22	16	16.00	0.00
instance n=100 48.alb	1	0	Optimal	13.00	15	15.00	0.00
instance n=100 480.alb	1	0	Optimal	0.10	15	15.00	0.00
instance n=100 481.alb	1	0	Optimal	0.11	15	15.00	0.00
instance n=100 482.alb	1	0	Optimal	0.23	15	15.00	0.00
instance n=100 483.alb	1	0	Optimal	0.09	14	14.00	0.00
instance n=100 484.alb	1	0	Optimal	0.17	14	14.00	0.00
instance n=100 485.alb	1	0	Optimal	0.38	16	16.00	0.00
instance n=100 486.alb	1	0	Optimal	0.09	15	15.00	0.00
instance n=100 487.alb	1	0	Optimal	0.10	15	15.00	0.00
instance n=100 488.alb	1	0	Optimal	0.36	16	16.00	0.00
instance n=100 489.alb	1	0	Optimal	0.38	13	13.00	0.00
instance n=100 49.alb	1	0	Optimal	30.00	14	14.00	0.00
instance n=100 490.alb	1	0	Optimal	0.12	15	15.00	0.00
instance n=100 491.alb	1	0	Optimal	0.39	16	16.00	0.00
instance n=100 492.alb	1	0	Optimal	1.03	14	14.00	0.00
instance n=100 493.alb	1	0	Optimal	0.37	14	14.00	0.00
instance n=100 494.alb	1	0	Optimal	0.08	14	14.00	0.00
instance n=100 495.alb	1	0	Optimal	0.16	15	15.00	0.00
instance n=100 496.alb	1	0	Optimal	0.37	14	14.00	0.00
instance n=100 497.alb	1	0	Optimal	0.10	13	13.00	0.00
instance n=100 498.alb	1	0	Optimal	0.09	14	14.00	0.00
instance n=100 499.alb	1	0	Optimal	0.10	14	14.00	0.00
instance n=100 5.alb	1	0	Optimal	2.86	22	22.00	0.00
instance n=100 50.alb	1	0	Optimal	30.01	14	14.00	0.00
instance n=100 500.alb	1	0	Optimal	0.10	14	14.00	0.00
instance n=100 501.alb	1	0	Optimal	1.54	62	62.00	0.00
instance n=100 502.alb	1	0	Optimal	0.36	64	64.00	0.00
instance n=100 503.alb	1	0	Optimal	0.93	60	60.00	0.00
instance n=100 504.alb	1	0	Optimal	7.72	60	60.00	0.00
instance n=100 505.alb	1	0	Optimal	0.42	61	61.00	0.00
instance n=100 506.alb	1	0	Optimal	0.59	57	57.00	0.00
instance n=100 507.alb	1	0	Optimal	2.08	59	59.00	0.00
instance n=100 508.alb	1	0	Optimal	2.77	56	56.00	0.00
instance n=100 509.alb	1	0	Optimal	0.55	57	57.00	0.00
instance n=100 51.alb	1	0	Solution	30.09	50	49.00	2.00
instance n=100 510.alb	1	0	Optimal	9.81	58	58.00	0.00
instance n=100 511.alb	1	0	Optimal	6.34	59	59.00	0.00
instance n=100 512.alb	1	0	Optimal	0.34	60	60.00	0.00
instance n=100 513.alb	1	0	Optimal	6.08	62	62.00	0.00
instance n=100 514.alb	1	0	Optimal	5.07	58	58.00	0.00
instance n=100 515.alb	1	0	Optimal	4.72	61	61.00	0.00
instance n=100 516.alb	1	0	Optimal	0.14	70	70.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 517.alb	1	0	Optimal	2.22	62	62.00	0.00
instance n=100 518.alb	1	0	Optimal	1.44	57	57.00	0.00
instance n=100 519.alb	1	0	Optimal	0.57	61	61.00	0.00
instance n=100 52.alb	1	0	Solution	30.09	53	52.00	1.89
instance n=100 520.alb	1	0	Optimal	4.09	60	60.00	0.00
instance n=100 521.alb	1	0	Optimal	0.54	70	70.00	0.00
instance n=100 522.alb	1	0	Optimal	9.26	59	59.00	0.00
instance n=100 523.alb	1	0	Optimal	4.84	55	55.00	0.00
instance n=100 524.alb	1	0	Optimal	3.76	59	59.00	0.00
instance n=100 525.alb	1	0	Optimal	4.70	62	62.00	0.00
instance n=100 53.alb	1	0	Optimal	11.93	52	52.00	0.00
instance n=100 54.alb	1	0	Solution	30.07	52	51.00	1.92
instance n=100 55.alb	1	0	Optimal	30.02	52	52.00	0.00
instance n=100 56.alb	1	0	Solution	30.06	53	51.00	3.77
instance n=100 57.alb	1	0	Solution	30.04	55	53.00	3.64
instance n=100 58.alb	1	0	Solution	30.08	57	56.00	1.75
instance n=100 59.alb	1	0	Optimal	30.03	57	57.00	0.00
instance n=100 6.alb	1	0	Optimal	30.01	22	22.00	0.00
instance n=100 60.alb	1	0	Solution	30.05	54	53.00	1.85
instance n=100 61.alb	1	0	Optimal	30.01	54	54.00	0.00
instance n=100 62.alb	1	0	Solution	30.05	52	50.00	3.85
instance n=100 63.alb	1	0	Optimal	30.01	61	61.00	0.00
instance n=100 64.alb	1	0	Solution	30.05	56	55.00	1.79
instance n=100 65.alb	1	0	Optimal	30.03	61	61.00	0.00
instance n=100 66.alb	1	0	Solution	30.04	52	50.00	3.85
instance n=100 67.alb	1	0	Solution	30.05	55	54.00	1.82
instance n=100 68.alb	1	0	Optimal	0.22	57	57.00	0.00
instance n=100 69.alb	1	0	Optimal	30.02	53	53.00	0.00
instance n=100 7.alb	1	0	Optimal	6.71	26	26.00	0.00
instance n=100 70.alb	1	0	Solution	30.06	53	51.00	3.77
instance n=100 71.alb	1	0	Solution	30.14	53	52.00	1.89
instance n=100 72.alb	1	0	Solution	30.05	54	52.00	3.70
instance n=100 73.alb	1	0	Solution	30.06	56	55.00	1.79
instance n=100 74.alb	1	0	Solution	30.26	52	50.00	3.85
instance n=100 75.alb	1	0	Solution	30.10	55	54.00	1.82
instance n=100 76.alb	1	0	Optimal	0.11	23	23.00	0.00
instance n=100 77.alb	1	0	Optimal	0.59	20	20.00	0.00
instance n=100 78.alb	1	0	Optimal	30.01	21	21.00	0.00
instance n=100 79.alb	1	0	Optimal	30.02	21	21.00	0.00
instance n=100 8.alb	1	0	Optimal	0.32	24	24.00	0.00
instance n=100 80.alb	1	0	Solution	30.03	23	22.00	4.35
instance n=100 81.alb	1	0	Optimal	0.64	20	20.00	0.00
instance n=100 82.alb	1	0	Optimal	0.13	21	21.00	0.00
instance n=100 83.alb	1	0	Optimal	30.01	22	22.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 84.alb	1	0	Solution	30.04	27	26.00	3.70
instance n=100 85.alb	1	0	Solution	30.04	25	24.00	4.00
instance n=100 86.alb	1	0	Optimal	0.65	23	23.00	0.00
instance n=100 87.alb	1	0	Optimal	0.88	22	22.00	0.00
instance n=100 88.alb	1	0	Solution	30.03	24	23.00	4.17
instance n=100 89.alb	1	0	Optimal	9.26	24	24.00	0.00
instance n=100 9.alb	1	0	Solution	30.08	24	23.00	4.17
instance n=100 90.alb	1	0	Solution	30.05	21	20.00	4.76
instance n=100 91.alb	1	0	Optimal	4.94	25	25.00	0.00
instance n=100 92.alb	1	0	Optimal	0.11	24	24.00	0.00
instance n=100 93.alb	1	0	Optimal	30.14	27	27.00	0.00
instance n=100 94.alb	1	0	Optimal	30.02	22	22.00	0.00
instance n=100 95.alb	1	0	Optimal	30.02	21	21.00	0.00
instance n=100 96.alb	1	0	Optimal	30.01	21	21.00	0.00
instance n=100 97.alb	1	0	Optimal	0.56	22	22.00	0.00
instance n=100 98.alb	1	0	Optimal	0.11	22	22.00	0.00
instance n=100 99.alb	1	0	Optimal	0.51	22	22.00	0.00
instance n=20 1.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 10.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 100.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 101.alb	1	0	Optimal	0.22	13	13.00	0.00
instance n=20 102.alb	1	0	Optimal	0.12	13	13.00	0.00
instance n=20 103.alb	1	0	Optimal	0.10	12	12.00	0.00
instance n=20 104.alb	1	0	Optimal	0.01	11	11.00	0.00
instance n=20 105.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=20 106.alb	1	0	Optimal	0.04	10	10.00	0.00
instance n=20 107.alb	1	0	Optimal	0.03	14	14.00	0.00
instance n=20 108.alb	1	0	Optimal	0.01	15	15.00	0.00
instance n=20 109.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 11.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 110.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 111.alb	1	0	Optimal	0.12	13	13.00	0.00
instance n=20 112.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 113.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=20 114.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=20 115.alb	1	0	Optimal	0.01	11	11.00	0.00
instance n=20 116.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 117.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 118.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 119.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 12.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 120.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 121.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 122.alb	1	0	Optimal	0.02	6	6.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 123.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 124.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 125.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 126.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 127.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 128.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 129.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 13.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 130.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 131.alb	1	0	Optimal	0.01	7	7.00	0.00
instance n=20 132.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 133.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 134.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 135.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 136.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 137.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 138.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 139.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 14.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 140.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 141.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 142.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 143.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 144.alb	1	0	Optimal	0.10	4	4.00	0.00
instance n=20 145.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 146.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 147.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 148.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 149.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 15.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 150.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 151.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 152.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 153.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 154.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 155.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 156.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 157.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 158.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 159.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 16.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=20 160.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 161.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 162.alb	1	0	Optimal	0.01	3	3.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 163.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 164.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 165.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 166.alb	1	0	Optimal	0.14	12	12.00	0.00
instance n=20 167.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 168.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 169.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 17.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 170.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=20 171.alb	1	0	Optimal	0.15	13	13.00	0.00
instance n=20 172.alb	1	0	Optimal	0.01	11	11.00	0.00
instance n=20 173.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=20 174.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=20 175.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 176.alb	1	0	Optimal	0.11	11	11.00	0.00
instance n=20 177.alb	1	0	Optimal	0.35	10	10.00	0.00
instance n=20 178.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 179.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=20 18.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 180.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 181.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=20 182.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=20 183.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=20 184.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 185.alb	1	0	Optimal	0.01	15	15.00	0.00
instance n=20 186.alb	1	0	Optimal	0.92	14	14.00	0.00
instance n=20 187.alb	1	0	Optimal	0.11	10	10.00	0.00
instance n=20 188.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=20 189.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 19.alb	1	0	Optimal	0.07	14	14.00	0.00
instance n=20 190.alb	1	0	Optimal	0.20	15	15.00	0.00
instance n=20 191.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 192.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 193.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 194.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 195.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 196.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 197.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 198.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 199.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 2.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 20.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=20 200.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 201.alb	1	0	Optimal	0.03	6	6.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 202.alb	1	0	Optimal	0.09	4	4.00	0.00
instance n=20 203.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 204.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 205.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 206.alb	1	0	Optimal	0.11	5	5.00	0.00
instance n=20 207.alb	1	0	Optimal	0.06	6	6.00	0.00
instance n=20 208.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 209.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 21.alb	1	0	Optimal	0.02	14	14.00	0.00
instance n=20 210.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 211.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 212.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 213.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 214.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 215.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 216.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 217.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 218.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 219.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 22.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=20 220.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 221.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 222.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 223.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 224.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 225.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 226.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 227.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 228.alb	1	0	Optimal	0.01	2	2.00	0.00
instance n=20 229.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 23.alb	1	0	Optimal	0.07	13	13.00	0.00
instance n=20 230.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 231.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 232.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 233.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 234.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 235.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 236.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 237.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 238.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 239.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 24.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=20 240.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 241.alb	1	0	Optimal	0.12	13	13.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 242.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=20 243.alb	1	0	Optimal	0.11	10	10.00	0.00
instance n=20 244.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 245.alb	1	0	Optimal	0.02	13	13.00	0.00
instance n=20 246.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=20 247.alb	1	0	Optimal	0.12	11	11.00	0.00
instance n=20 248.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 249.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=20 25.alb	1	0	Optimal	0.12	11	11.00	0.00
instance n=20 250.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 251.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 252.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=20 253.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=20 254.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 255.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=20 256.alb	1	0	Optimal	0.01	14	14.00	0.00
instance n=20 257.alb	1	0	Optimal	0.12	10	10.00	0.00
instance n=20 258.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 259.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=20 26.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 260.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 261.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 262.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=20 263.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=20 264.alb	1	0	Optimal	0.12	12	12.00	0.00
instance n=20 265.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 266.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 267.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 268.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 269.alb	1	0	Optimal	0.10	7	7.00	0.00
instance n=20 27.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=20 270.alb	1	0	Optimal	0.10	7	7.00	0.00
instance n=20 271.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 272.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 273.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 274.alb	1	0	Optimal	0.09	6	6.00	0.00
instance n=20 275.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 276.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 277.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 278.alb	1	0	Optimal	0.10	6	6.00	0.00
instance n=20 279.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 28.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 280.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 281.alb	1	0	Optimal	0.02	4	4.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 282.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 283.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 284.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 285.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 286.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 287.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 288.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 289.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 29.alb	1	0	Optimal	0.05	10	10.00	0.00
instance n=20 290.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 291.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 292.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 293.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 294.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 295.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 296.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 297.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 298.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 299.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 3.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 30.alb	1	0	Optimal	0.05	16	16.00	0.00
instance n=20 300.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 301.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 302.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 303.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 304.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 305.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 306.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 307.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 308.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 309.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 31.alb	1	0	Optimal	0.07	12	12.00	0.00
instance n=20 310.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 311.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 312.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 313.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 314.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 315.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 316.alb	1	0	Optimal	0.06	10	10.00	0.00
instance n=20 317.alb	1	0	Optimal	0.06	10	10.00	0.00
instance n=20 318.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 319.alb	1	0	Optimal	0.19	14	14.00	0.00
instance n=20 32.alb	1	0	Optimal	0.07	13	13.00	0.00
instance n=20 320.alb	1	0	Optimal	0.03	12	12.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 321.alb	1	0	Optimal	1.19	14	14.00	0.00
instance n=20 322.alb	1	0	Optimal	0.31	12	12.00	0.00
instance n=20 323.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 324.alb	1	0	Optimal	0.82	9	9.00	0.00
instance n=20 325.alb	1	0	Optimal	0.01	14	14.00	0.00
instance n=20 326.alb	1	0	Optimal	0.61	14	14.00	0.00
instance n=20 327.alb	1	0	Optimal	1.30	13	13.00	0.00
instance n=20 328.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 329.alb	1	0	Optimal	0.06	10	10.00	0.00
instance n=20 33.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 330.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=20 331.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=20 332.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=20 333.alb	1	0	Optimal	0.24	11	11.00	0.00
instance n=20 334.alb	1	0	Optimal	0.08	10	10.00	0.00
instance n=20 335.alb	1	0	Optimal	0.01	14	14.00	0.00
instance n=20 336.alb	1	0	Optimal	0.01	11	11.00	0.00
instance n=20 337.alb	1	0	Optimal	0.07	10	10.00	0.00
instance n=20 338.alb	1	0	Optimal	0.11	14	14.00	0.00
instance n=20 339.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 34.alb	1	0	Optimal	0.12	12	12.00	0.00
instance n=20 340.alb	1	0	Optimal	0.12	11	11.00	0.00
instance n=20 341.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 342.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 343.alb	1	0	Optimal	0.06	6	6.00	0.00
instance n=20 344.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 345.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 346.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 347.alb	1	0	Optimal	0.12	6	6.00	0.00
instance n=20 348.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 349.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 35.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=20 350.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 351.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 352.alb	1	0	Optimal	0.03	4	4.00	0.00
instance n=20 353.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 354.alb	1	0	Optimal	0.04	6	6.00	0.00
instance n=20 355.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 356.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 357.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 358.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 359.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 36.alb	1	0	Optimal	0.02	13	13.00	0.00
instance n=20 360.alb	1	0	Optimal	0.03	6	6.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 361.alb	1	0	Optimal	0.04	5	5.00	0.00
instance n=20 362.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 363.alb	1	0	Optimal	0.56	7	7.00	0.00
instance n=20 364.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 365.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 366.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 367.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 368.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 369.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 37.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 370.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 371.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 372.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 373.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 374.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 375.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 376.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 377.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 378.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 379.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 38.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 380.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 381.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 382.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 383.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 384.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 385.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 386.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 387.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 388.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 389.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 39.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=20 390.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 391.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 392.alb	1	0	Optimal	0.03	14	14.00	0.00
instance n=20 393.alb	1	0	Optimal	0.11	11	11.00	0.00
instance n=20 394.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=20 395.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 396.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=20 397.alb	1	0	Optimal	0.10	10	10.00	0.00
instance n=20 398.alb	1	0	Optimal	0.01	11	11.00	0.00
instance n=20 399.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 4.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 40.alb	1	0	Optimal	0.04	12	12.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 400.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 401.alb	1	0	Optimal	0.12	12	12.00	0.00
instance n=20 402.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=20 403.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 404.alb	1	0	Optimal	0.11	10	10.00	0.00
instance n=20 405.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=20 406.alb	1	0	Optimal	0.01	14	14.00	0.00
instance n=20 407.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 408.alb	1	0	Optimal	0.03	14	14.00	0.00
instance n=20 409.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=20 41.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 410.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 411.alb	1	0	Optimal	0.12	15	15.00	0.00
instance n=20 412.alb	1	0	Optimal	0.11	11	11.00	0.00
instance n=20 413.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=20 414.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=20 415.alb	1	0	Optimal	0.11	10	10.00	0.00
instance n=20 416.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 417.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 418.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 419.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 42.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 420.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 421.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 422.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 423.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 424.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 425.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 426.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 427.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 428.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 429.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 43.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 430.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 431.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=20 432.alb	1	0	Optimal	0.11	5	5.00	0.00
instance n=20 433.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 434.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 435.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=20 436.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 437.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 438.alb	1	0	Optimal	0.12	6	6.00	0.00
instance n=20 439.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 44.alb	1	0	Optimal	0.01	5	5.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 440.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 441.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 442.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 443.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 444.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 445.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 446.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 447.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 448.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 449.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 45.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 450.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 451.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 452.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 453.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 454.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 455.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 456.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 457.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 458.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 459.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 46.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 460.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 461.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 462.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 463.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 464.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 465.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 466.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 467.alb	1	0	Optimal	0.01	14	14.00	0.00
instance n=20 468.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 469.alb	1	0	Optimal	0.01	14	14.00	0.00
instance n=20 47.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 470.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 471.alb	1	0	Optimal	0.01	12	12.00	0.00
instance n=20 472.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 473.alb	1	0	Optimal	0.09	10	10.00	0.00
instance n=20 474.alb	1	0	Optimal	0.01	14	14.00	0.00
instance n=20 475.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 476.alb	1	0	Optimal	0.01	11	11.00	0.00
instance n=20 477.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=20 478.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 479.alb	1	0	Optimal	0.02	13	13.00	0.00
instance n=20 48.alb	1	0	Optimal	0.02	5	5.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 480.alb	1	0	Optimal	0.01	13	13.00	0.00
instance n=20 481.alb	1	0	Optimal	0.02	13	13.00	0.00
instance n=20 482.alb	1	0	Optimal	0.02	13	13.00	0.00
instance n=20 483.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 484.alb	1	0	Optimal	0.02	13	13.00	0.00
instance n=20 485.alb	1	0	Optimal	0.03	15	15.00	0.00
instance n=20 486.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=20 487.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 488.alb	1	0	Optimal	0.03	15	15.00	0.00
instance n=20 489.alb	1	0	Optimal	0.02	12	12.00	0.00
instance n=20 49.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 490.alb	1	0	Optimal	0.03	12	12.00	0.00
instance n=20 491.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 492.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 493.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 494.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 495.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 496.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 497.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 498.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 499.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 5.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 50.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 500.alb	1	0	Optimal	0.01	8	8.00	0.00
instance n=20 501.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 502.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 503.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 504.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 505.alb	1	0	Optimal	0.02	6	6.00	0.00
instance n=20 506.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 507.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 508.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 509.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 51.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 510.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 511.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 512.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 513.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 514.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 515.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=20 516.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 517.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 518.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 519.alb	1	0	Optimal	0.02	3	3.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 52.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 520.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 521.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 522.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 523.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 524.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 525.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 53.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 54.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 55.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 56.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 57.alb	1	0	Optimal	0.01	4	4.00	0.00
instance n=20 58.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 59.alb	1	0	Optimal	0.11	4	4.00	0.00
instance n=20 6.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 60.alb	1	0	Optimal	0.04	6	6.00	0.00
instance n=20 61.alb	1	0	Optimal	0.11	7	7.00	0.00
instance n=20 62.alb	1	0	Optimal	0.03	5	5.00	0.00
instance n=20 63.alb	1	0	Optimal	0.11	5	5.00	0.00
instance n=20 64.alb	1	0	Optimal	0.01	5	5.00	0.00
instance n=20 65.alb	1	0	Optimal	0.02	5	5.00	0.00
instance n=20 66.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 67.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 68.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 69.alb	1	0	Optimal	0.01	2	2.00	0.00
instance n=20 7.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 70.alb	1	0	Optimal	0.03	3	3.00	0.00
instance n=20 71.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 72.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 73.alb	1	0	Optimal	0.01	2	2.00	0.00
instance n=20 74.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 75.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 76.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 77.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 78.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 79.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 8.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 80.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 81.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 82.alb	1	0	Optimal	0.02	4	4.00	0.00
instance n=20 83.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 84.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 85.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 86.alb	1	0	Optimal	0.01	3	3.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 87.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 88.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 89.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 9.alb	1	0	Optimal	0.02	3	3.00	0.00
instance n=20 90.alb	1	0	Optimal	0.01	3	3.00	0.00
instance n=20 91.alb	1	0	Optimal	0.03	11	11.00	0.00
instance n=20 92.alb	1	0	Optimal	0.02	11	11.00	0.00
instance n=20 93.alb	1	0	Optimal	0.03	13	13.00	0.00
instance n=20 94.alb	1	0	Optimal	0.02	10	10.00	0.00
instance n=20 95.alb	1	0	Optimal	0.10	12	12.00	0.00
instance n=20 96.alb	1	0	Optimal	0.02	10	10.00	0.00
instance n=20 97.alb	1	0	Optimal	0.13	15	15.00	0.00
instance n=20 98.alb	1	0	Optimal	0.02	13	13.00	0.00
instance n=20 99.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=50 1.alb	1	0	Optimal	0.15	8	8.00	0.00
instance n=50 10.alb	1	0	Optimal	30.02	7	7.00	0.00
instance n=50 100.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 101.alb	1	0	Optimal	12.63	30	30.00	0.00
instance n=50 102.alb	1	0	Solution	30.21	32	31.00	3.13
instance n=50 103.alb	1	0	Optimal	0.30	29	29.00	0.00
instance n=50 104.alb	1	0	Optimal	2.26	27	27.00	0.00
instance n=50 105.alb	1	0	Optimal	24.08	24	24.00	0.00
instance n=50 106.alb	1	0	Optimal	9.21	28	28.00	0.00
instance n=50 107.alb	1	0	Optimal	3.41	28	28.00	0.00
instance n=50 108.alb	1	0	Optimal	0.74	30	30.00	0.00
instance n=50 109.alb	1	0	Optimal	0.08	30	30.00	0.00
instance n=50 11.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 110.alb	1	0	Optimal	0.61	26	26.00	0.00
instance n=50 111.alb	1	0	Optimal	0.37	28	28.00	0.00
instance n=50 112.alb	1	0	Optimal	1.47	27	27.00	0.00
instance n=50 113.alb	1	0	Optimal	10.39	28	28.00	0.00
instance n=50 114.alb	1	0	Optimal	1.60	27	27.00	0.00
instance n=50 115.alb	1	0	Solution	30.08	28	26.00	7.14
instance n=50 116.alb	1	0	Optimal	0.78	32	32.00	0.00
instance n=50 117.alb	1	0	Optimal	11.44	27	27.00	0.00
instance n=50 118.alb	1	0	Optimal	1.14	29	29.00	0.00
instance n=50 119.alb	1	0	Optimal	0.28	25	25.00	0.00
instance n=50 12.alb	1	0	Optimal	30.01	6	6.00	0.00
instance n=50 120.alb	1	0	Optimal	0.47	27	27.00	0.00
instance n=50 121.alb	1	0	Optimal	8.76	32	32.00	0.00
instance n=50 122.alb	1	0	Solution	30.07	29	28.00	3.45
instance n=50 123.alb	1	0	Optimal	0.61	32	32.00	0.00
instance n=50 124.alb	1	0	Optimal	1.64	29	29.00	0.00
instance n=50 125.alb	1	0	Optimal	0.10	33	33.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 126.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 127.alb	1	0	Optimal	0.30	14	14.00	0.00
instance n=50 128.alb	1	0	Optimal	0.37	12	12.00	0.00
instance n=50 129.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 13.alb	1	0	Optimal	30.02	6	6.00	0.00
instance n=50 130.alb	1	0	Optimal	0.14	13	13.00	0.00
instance n=50 131.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 132.alb	1	0	Optimal	1.85	12	12.00	0.00
instance n=50 133.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 134.alb	1	0	Optimal	0.11	14	14.00	0.00
instance n=50 135.alb	1	0	Optimal	0.08	13	13.00	0.00
instance n=50 136.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 137.alb	1	0	Optimal	5.82	11	11.00	0.00
instance n=50 138.alb	1	0	Optimal	0.06	12	12.00	0.00
instance n=50 139.alb	1	0	Optimal	4.31	11	11.00	0.00
instance n=50 14.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 140.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 141.alb	1	0	Optimal	0.07	13	13.00	0.00
instance n=50 142.alb	1	0	Optimal	1.07	11	11.00	0.00
instance n=50 143.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 144.alb	1	0	Optimal	0.08	13	13.00	0.00
instance n=50 145.alb	1	0	Optimal	0.05	10	10.00	0.00
instance n=50 146.alb	1	0	Optimal	0.13	13	13.00	0.00
instance n=50 147.alb	1	0	Optimal	0.18	13	13.00	0.00
instance n=50 148.alb	1	0	Optimal	0.04	10	10.00	0.00
instance n=50 149.alb	1	0	Optimal	0.09	12	12.00	0.00
instance n=50 15.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 150.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 151.alb	1	0	Optimal	0.80	7	7.00	0.00
instance n=50 152.alb	1	0	Optimal	30.01	7	7.00	0.00
instance n=50 153.alb	1	0	Optimal	30.02	7	7.00	0.00
instance n=50 154.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 155.alb	1	0	Optimal	2.65	7	7.00	0.00
instance n=50 156.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 157.alb	1	0	Optimal	0.06	8	8.00	0.00
instance n=50 158.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 159.alb	1	0	Optimal	15.29	7	7.00	0.00
instance n=50 16.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 160.alb	1	0	Optimal	0.18	8	8.00	0.00
instance n=50 161.alb	1	0	Optimal	30.02	7	7.00	0.00
instance n=50 162.alb	1	0	Optimal	30.02	8	8.00	0.00
instance n=50 163.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 164.alb	1	0	Optimal	19.38	7	7.00	0.00
instance n=50 165.alb	1	0	Optimal	30.00	8	8.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 166.alb	1	0	Optimal	0.14	8	8.00	0.00
instance n=50 167.alb	1	0	Optimal	2.38	7	7.00	0.00
instance n=50 168.alb	1	0	Optimal	2.29	8	8.00	0.00
instance n=50 169.alb	1	0	Optimal	0.36	8	8.00	0.00
instance n=50 17.alb	1	0	Optimal	0.48	7	7.00	0.00
instance n=50 170.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 171.alb	1	0	Optimal	30.01	8	8.00	0.00
instance n=50 172.alb	1	0	Optimal	0.24	7	7.00	0.00
instance n=50 173.alb	1	0	Optimal	0.71	7	7.00	0.00
instance n=50 174.alb	1	0	Optimal	4.31	7	7.00	0.00
instance n=50 175.alb	1	0	Optimal	30.02	7	7.00	0.00
instance n=50 176.alb	1	0	Optimal	30.02	27	27.00	0.00
instance n=50 177.alb	1	0	Solution	30.06	28	27.00	3.57
instance n=50 178.alb	1	0	Solution	30.17	28	27.00	3.57
instance n=50 179.alb	1	0	Optimal	30.03	26	26.00	0.00
instance n=50 18.alb	1	0	Optimal	2.86	7	7.00	0.00
instance n=50 180.alb	1	0	Optimal	30.02	26	26.00	0.00
instance n=50 181.alb	1	0	Optimal	30.03	29	29.00	0.00
instance n=50 182.alb	1	0	Solution	30.19	27	26.00	3.70
instance n=50 183.alb	1	0	Optimal	30.02	28	28.00	0.00
instance n=50 184.alb	1	0	Optimal	0.06	38	38.00	0.00
instance n=50 185.alb	1	0	Optimal	15.85	26	26.00	0.00
instance n=50 186.alb	1	0	Optimal	1.75	26	26.00	0.00
instance n=50 187.alb	1	0	Solution	30.24	26	25.00	3.85
instance n=50 188.alb	1	0	Solution	30.04	25	24.00	4.00
instance n=50 189.alb	1	0	Solution	30.06	26	25.00	3.85
instance n=50 19.alb	1	0	Optimal	0.21	8	8.00	0.00
instance n=50 190.alb	1	0	Optimal	6.88	30	30.00	0.00
instance n=50 191.alb	1	0	Optimal	24.27	27	27.00	0.00
instance n=50 192.alb	1	0	Optimal	1.52	27	27.00	0.00
instance n=50 193.alb	1	0	Optimal	30.03	28	28.00	0.00
instance n=50 194.alb	1	0	Optimal	22.99	28	28.00	0.00
instance n=50 195.alb	1	0	Optimal	2.54	28	28.00	0.00
instance n=50 196.alb	1	0	Optimal	30.03	27	27.00	0.00
instance n=50 197.alb	1	0	Optimal	2.10	28	28.00	0.00
instance n=50 198.alb	1	0	Optimal	0.03	28	28.00	0.00
instance n=50 199.alb	1	0	Optimal	0.04	29	29.00	0.00
instance n=50 2.alb	1	0	Optimal	0.42	6	6.00	0.00
instance n=50 20.alb	1	0	Optimal	0.05	8	8.00	0.00
instance n=50 200.alb	1	0	Solution	30.05	25	24.00	4.00
instance n=50 201.alb	1	0	Optimal	0.07	13	13.00	0.00
instance n=50 202.alb	1	0	Optimal	1.56	9	9.00	0.00
instance n=50 203.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 204.alb	1	0	Optimal	30.02	10	10.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 205.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 206.alb	1	0	Solution	30.29	12	11.00	8.33
instance n=50 207.alb	1	0	Optimal	0.05	10	10.00	0.00
instance n=50 208.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 209.alb	1	0	Optimal	0.90	11	11.00	0.00
instance n=50 21.alb	1	0	Optimal	30.02	6	6.00	0.00
instance n=50 210.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 211.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=50 212.alb	1	0	Optimal	0.03	10	10.00	0.00
instance n=50 213.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 214.alb	1	0	Optimal	0.25	11	11.00	0.00
instance n=50 215.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 216.alb	1	0	Optimal	30.03	12	12.00	0.00
instance n=50 217.alb	1	0	Optimal	30.02	13	13.00	0.00
instance n=50 218.alb	1	0	Optimal	0.18	12	12.00	0.00
instance n=50 219.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 22.alb	1	0	Optimal	0.41	7	7.00	0.00
instance n=50 220.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 221.alb	1	0	Optimal	0.31	11	11.00	0.00
instance n=50 222.alb	1	0	Optimal	0.05	14	14.00	0.00
instance n=50 223.alb	1	0	Optimal	0.82	11	11.00	0.00
instance n=50 224.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 225.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=50 226.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 227.alb	1	0	Optimal	0.07	6	6.00	0.00
instance n=50 228.alb	1	0	Optimal	0.07	6	6.00	0.00
instance n=50 229.alb	1	0	Optimal	0.04	6	6.00	0.00
instance n=50 23.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 230.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 231.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 232.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 233.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=50 234.alb	1	0	Optimal	0.62	8	8.00	0.00
instance n=50 235.alb	1	0	Optimal	0.09	7	7.00	0.00
instance n=50 236.alb	1	0	Optimal	0.10	7	7.00	0.00
instance n=50 237.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 238.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 239.alb	1	0	Optimal	0.07	7	7.00	0.00
instance n=50 24.alb	1	0	Optimal	30.02	7	7.00	0.00
instance n=50 240.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 241.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 242.alb	1	0	Optimal	0.02	8	8.00	0.00
instance n=50 243.alb	1	0	Optimal	0.10	7	7.00	0.00
instance n=50 244.alb	1	0	Optimal	0.07	7	7.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 245.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 246.alb	1	0	Optimal	0.24	8	8.00	0.00
instance n=50 247.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 248.alb	1	0	Optimal	0.07	7	7.00	0.00
instance n=50 249.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 25.alb	1	0	Optimal	12.27	6	6.00	0.00
instance n=50 250.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 251.alb	1	0	Optimal	1.44	27	27.00	0.00
instance n=50 252.alb	1	0	Optimal	3.29	32	32.00	0.00
instance n=50 253.alb	1	0	Optimal	4.08	28	28.00	0.00
instance n=50 254.alb	1	0	Optimal	0.07	30	30.00	0.00
instance n=50 255.alb	1	0	Optimal	2.22	29	29.00	0.00
instance n=50 256.alb	1	0	Optimal	0.35	30	30.00	0.00
instance n=50 257.alb	1	0	Optimal	4.41	33	33.00	0.00
instance n=50 258.alb	1	0	Optimal	3.79	28	28.00	0.00
instance n=50 259.alb	1	0	Optimal	3.03	31	31.00	0.00
instance n=50 26.alb	1	0	Optimal	30.04	27	27.00	0.00
instance n=50 260.alb	1	0	Optimal	0.65	29	29.00	0.00
instance n=50 261.alb	1	0	Optimal	2.76	28	28.00	0.00
instance n=50 262.alb	1	0	Optimal	0.59	31	31.00	0.00
instance n=50 263.alb	1	0	Optimal	1.79	29	29.00	0.00
instance n=50 264.alb	1	0	Optimal	3.78	27	27.00	0.00
instance n=50 265.alb	1	0	Optimal	0.54	27	27.00	0.00
instance n=50 266.alb	1	0	Optimal	4.69	29	29.00	0.00
instance n=50 267.alb	1	0	Optimal	4.10	28	28.00	0.00
instance n=50 268.alb	1	0	Optimal	5.97	29	29.00	0.00
instance n=50 269.alb	1	0	Optimal	1.09	26	26.00	0.00
instance n=50 27.alb	1	0	Optimal	13.79	30	30.00	0.00
instance n=50 270.alb	1	0	Optimal	0.74	28	28.00	0.00
instance n=50 271.alb	1	0	Optimal	3.47	31	31.00	0.00
instance n=50 272.alb	1	0	Optimal	2.48	27	27.00	0.00
instance n=50 273.alb	1	0	Optimal	5.08	27	27.00	0.00
instance n=50 274.alb	1	0	Optimal	0.08	29	29.00	0.00
instance n=50 275.alb	1	0	Optimal	1.07	27	27.00	0.00
instance n=50 276.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 277.alb	1	0	Optimal	0.12	13	13.00	0.00
instance n=50 278.alb	1	0	Optimal	0.28	12	12.00	0.00
instance n=50 279.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 28.alb	1	0	Optimal	30.01	28	28.00	0.00
instance n=50 280.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 281.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 282.alb	1	0	Optimal	3.95	12	12.00	0.00
instance n=50 283.alb	1	0	Optimal	0.06	12	12.00	0.00
instance n=50 284.alb	1	0	Optimal	0.04	11	11.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 285.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 286.alb	1	0	Optimal	0.65	11	11.00	0.00
instance n=50 287.alb	1	0	Optimal	0.49	12	12.00	0.00
instance n=50 288.alb	1	0	Optimal	0.34	10	10.00	0.00
instance n=50 289.alb	1	0	Optimal	0.24	11	11.00	0.00
instance n=50 29.alb	1	0	Optimal	0.04	29	29.00	0.00
instance n=50 290.alb	1	0	Optimal	0.13	14	14.00	0.00
instance n=50 291.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 292.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 293.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=50 294.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=50 295.alb	1	0	Optimal	0.51	16	16.00	0.00
instance n=50 296.alb	1	0	Optimal	0.14	13	13.00	0.00
instance n=50 297.alb	1	0	Optimal	0.27	13	13.00	0.00
instance n=50 298.alb	1	0	Optimal	0.07	11	11.00	0.00
instance n=50 299.alb	1	0	Optimal	1.11	12	12.00	0.00
instance n=50 3.alb	1	0	Optimal	2.53	8	8.00	0.00
instance n=50 30.alb	1	0	Optimal	30.02	26	26.00	0.00
instance n=50 300.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 301.alb	1	0	Optimal	30.02	6	6.00	0.00
instance n=50 302.alb	1	0	Optimal	30.01	7	7.00	0.00
instance n=50 303.alb	1	0	Optimal	30.02	8	8.00	0.00
instance n=50 304.alb	1	0	Optimal	0.47	7	7.00	0.00
instance n=50 305.alb	1	0	Optimal	0.28	8	8.00	0.00
instance n=50 306.alb	1	0	Optimal	30.01	7	7.00	0.00
instance n=50 307.alb	1	0	Optimal	30.01	7	7.00	0.00
instance n=50 308.alb	1	0	Optimal	30.02	8	8.00	0.00
instance n=50 309.alb	1	0	Optimal	1.57	7	7.00	0.00
instance n=50 31.alb	1	0	Solution	30.05	28	27.00	3.57
instance n=50 310.alb	1	0	Optimal	0.14	8	8.00	0.00
instance n=50 311.alb	1	0	Optimal	9.64	8	8.00	0.00
instance n=50 312.alb	1	0	Optimal	0.25	6	6.00	0.00
instance n=50 313.alb	1	0	Optimal	30.01	8	8.00	0.00
instance n=50 314.alb	1	0	Optimal	30.01	7	7.00	0.00
instance n=50 315.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 316.alb	1	0	Optimal	0.68	8	8.00	0.00
instance n=50 317.alb	1	0	Optimal	0.05	6	6.00	0.00
instance n=50 318.alb	1	0	Optimal	0.06	8	8.00	0.00
instance n=50 319.alb	1	0	Optimal	0.20	7	7.00	0.00
instance n=50 32.alb	1	0	Optimal	1.64	25	25.00	0.00
instance n=50 320.alb	1	0	Optimal	30.01	8	8.00	0.00
instance n=50 321.alb	1	0	Optimal	0.35	6	6.00	0.00
instance n=50 322.alb	1	0	Optimal	30.03	7	7.00	0.00
instance n=50 323.alb	1	0	Optimal	30.01	7	7.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 324.alb	1	0	Optimal	30.02	7	7.00	0.00
instance n=50 325.alb	1	0	Optimal	0.22	7	7.00	0.00
instance n=50 326.alb	1	0	Optimal	0.62	33	33.00	0.00
instance n=50 327.alb	1	0	Optimal	30.02	28	28.00	0.00
instance n=50 328.alb	1	0	Optimal	0.43	32	32.00	0.00
instance n=50 329.alb	1	0	Solution	30.05	25	24.00	4.00
instance n=50 33.alb	1	0	Solution	30.07	25	24.00	4.00
instance n=50 330.alb	1	0	Optimal	0.08	29	29.00	0.00
instance n=50 331.alb	1	0	Optimal	30.02	29	29.00	0.00
instance n=50 332.alb	1	0	Solution	30.67	25	24.00	4.00
instance n=50 333.alb	1	0	Optimal	30.03	28	28.00	0.00
instance n=50 334.alb	1	0	Optimal	0.04	29	29.00	0.00
instance n=50 335.alb	1	0	Optimal	30.02	27	27.00	0.00
instance n=50 336.alb	1	0	Solution	30.05	26	25.00	3.85
instance n=50 337.alb	1	0	Optimal	0.50	26	26.00	0.00
instance n=50 338.alb	1	0	Optimal	30.04	26	26.00	0.00
instance n=50 339.alb	1	0	Optimal	30.01	27	27.00	0.00
instance n=50 34.alb	1	0	Optimal	0.34	30	30.00	0.00
instance n=50 340.alb	1	0	Solution	30.13	28	27.00	3.57
instance n=50 341.alb	1	0	Optimal	30.02	27	27.00	0.00
instance n=50 342.alb	1	0	Solution	30.23	28	27.00	3.57
instance n=50 343.alb	1	0	Optimal	13.69	27	27.00	0.00
instance n=50 344.alb	1	0	Optimal	26.84	30	30.00	0.00
instance n=50 345.alb	1	0	Optimal	30.01	29	29.00	0.00
instance n=50 346.alb	1	0	Optimal	5.06	27	27.00	0.00
instance n=50 347.alb	1	0	Optimal	2.32	25	25.00	0.00
instance n=50 348.alb	1	0	Optimal	0.05	30	30.00	0.00
instance n=50 349.alb	1	0	Optimal	30.02	28	28.00	0.00
instance n=50 35.alb	1	0	Optimal	4.64	31	31.00	0.00
instance n=50 350.alb	1	0	Solution	30.06	24	23.00	4.17
instance n=50 351.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 352.alb	1	0	Optimal	19.50	10	10.00	0.00
instance n=50 353.alb	1	0	Optimal	0.09	13	13.00	0.00
instance n=50 354.alb	1	0	Solution	30.03	14	13.00	7.14
instance n=50 355.alb	1	0	Optimal	0.10	11	11.00	0.00
instance n=50 356.alb	1	0	Optimal	0.19	15	15.00	0.00
instance n=50 357.alb	1	0	Optimal	0.13	12	12.00	0.00
instance n=50 358.alb	1	0	Optimal	0.22	11	11.00	0.00
instance n=50 359.alb	1	0	Optimal	0.06	10	10.00	0.00
instance n=50 36.alb	1	0	Optimal	0.08	31	31.00	0.00
instance n=50 360.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=50 361.alb	1	0	Optimal	0.21	11	11.00	0.00
instance n=50 362.alb	1	0	Optimal	0.05	10	10.00	0.00
instance n=50 363.alb	1	0	Solution	30.06	12	11.00	8.33

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 364.alb	1	0	Optimal	0.13	13	13.00	0.00
instance n=50 365.alb	1	0	Optimal	0.37	11	11.00	0.00
instance n=50 366.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 367.alb	1	0	Optimal	0.08	12	12.00	0.00
instance n=50 368.alb	1	0	Optimal	4.50	12	12.00	0.00
instance n=50 369.alb	1	0	Optimal	0.39	12	12.00	0.00
instance n=50 37.alb	1	0	Solution	30.07	32	31.00	3.13
instance n=50 370.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 371.alb	1	0	Optimal	15.22	11	11.00	0.00
instance n=50 372.alb	1	0	Optimal	5.79	10	10.00	0.00
instance n=50 373.alb	1	0	Optimal	1.14	12	12.00	0.00
instance n=50 374.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 375.alb	1	0	Optimal	3.63	13	13.00	0.00
instance n=50 376.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 377.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 378.alb	1	0	Optimal	0.06	8	8.00	0.00
instance n=50 379.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 38.alb	1	0	Optimal	30.02	31	31.00	0.00
instance n=50 380.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 381.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 382.alb	1	0	Optimal	0.10	6	6.00	0.00
instance n=50 383.alb	1	0	Optimal	0.08	7	7.00	0.00
instance n=50 384.alb	1	0	Optimal	0.27	8	8.00	0.00
instance n=50 385.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 386.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 387.alb	1	0	Optimal	0.05	8	8.00	0.00
instance n=50 388.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 389.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 39.alb	1	0	Solution	30.08	29	28.00	3.45
instance n=50 390.alb	1	0	Optimal	0.35	7	7.00	0.00
instance n=50 391.alb	1	0	Optimal	0.10	7	7.00	0.00
instance n=50 392.alb	1	0	Optimal	0.09	8	8.00	0.00
instance n=50 393.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 394.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 395.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 396.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 397.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 398.alb	1	0	Optimal	0.06	6	6.00	0.00
instance n=50 399.alb	1	0	Optimal	4.58	7	7.00	0.00
instance n=50 4.alb	1	0	Optimal	0.10	7	7.00	0.00
instance n=50 40.alb	1	0	Optimal	30.01	26	26.00	0.00
instance n=50 400.alb	1	0	Optimal	0.06	8	8.00	0.00
instance n=50 401.alb	1	0	Solution	30.07	28	27.00	3.57
instance n=50 402.alb	1	0	Optimal	3.54	27	27.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 403.alb	1	0	Optimal	3.00	34	34.00	0.00
instance n=50 404.alb	1	0	Optimal	4.40	31	31.00	0.00
instance n=50 405.alb	1	0	Optimal	3.46	27	27.00	0.00
instance n=50 406.alb	1	0	Optimal	3.84	32	32.00	0.00
instance n=50 407.alb	1	0	Optimal	6.81	29	29.00	0.00
instance n=50 408.alb	1	0	Optimal	0.49	26	26.00	0.00
instance n=50 409.alb	1	0	Optimal	8.50	33	33.00	0.00
instance n=50 41.alb	1	0	Optimal	30.01	25	25.00	0.00
instance n=50 410.alb	1	0	Optimal	0.17	28	28.00	0.00
instance n=50 411.alb	1	0	Optimal	0.40	29	29.00	0.00
instance n=50 412.alb	1	0	Optimal	0.12	26	26.00	0.00
instance n=50 413.alb	1	0	Optimal	0.18	30	30.00	0.00
instance n=50 414.alb	1	0	Solution	30.08	27	26.00	3.70
instance n=50 415.alb	1	0	Optimal	0.38	28	28.00	0.00
instance n=50 416.alb	1	0	Optimal	0.23	27	27.00	0.00
instance n=50 417.alb	1	0	Solution	30.05	30	29.00	3.33
instance n=50 418.alb	1	0	Optimal	2.09	27	27.00	0.00
instance n=50 419.alb	1	0	Optimal	14.37	33	33.00	0.00
instance n=50 42.alb	1	0	Solution	30.12	24	23.00	4.17
instance n=50 420.alb	1	0	Optimal	13.73	28	28.00	0.00
instance n=50 421.alb	1	0	Optimal	2.37	34	34.00	0.00
instance n=50 422.alb	1	0	Optimal	4.18	29	29.00	0.00
instance n=50 423.alb	1	0	Optimal	0.24	29	29.00	0.00
instance n=50 424.alb	1	0	Optimal	1.10	27	27.00	0.00
instance n=50 425.alb	1	0	Optimal	6.62	34	34.00	0.00
instance n=50 426.alb	1	0	Optimal	0.29	11	11.00	0.00
instance n=50 427.alb	1	0	Optimal	0.12	12	12.00	0.00
instance n=50 428.alb	1	0	Optimal	0.13	13	13.00	0.00
instance n=50 429.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 43.alb	1	0	Optimal	2.26	25	25.00	0.00
instance n=50 430.alb	1	0	Optimal	0.88	14	14.00	0.00
instance n=50 431.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 432.alb	1	0	Optimal	0.21	12	12.00	0.00
instance n=50 433.alb	1	0	Optimal	0.25	12	12.00	0.00
instance n=50 434.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 435.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 436.alb	1	0	Optimal	0.07	11	11.00	0.00
instance n=50 437.alb	1	0	Optimal	3.34	12	12.00	0.00
instance n=50 438.alb	1	0	Optimal	0.90	10	10.00	0.00
instance n=50 439.alb	1	0	Optimal	0.30	12	12.00	0.00
instance n=50 44.alb	1	0	Solution	30.04	25	24.00	4.00
instance n=50 440.alb	1	0	Optimal	0.77	13	13.00	0.00
instance n=50 441.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 442.alb	1	0	Optimal	0.04	12	12.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 443.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 444.alb	1	0	Optimal	0.05	12	12.00	0.00
instance n=50 445.alb	1	0	Optimal	0.22	12	12.00	0.00
instance n=50 446.alb	1	0	Optimal	0.11	12	12.00	0.00
instance n=50 447.alb	1	0	Optimal	0.11	13	13.00	0.00
instance n=50 448.alb	1	0	Optimal	0.43	12	12.00	0.00
instance n=50 449.alb	1	0	Optimal	0.26	11	11.00	0.00
instance n=50 45.alb	1	0	Solution	30.09	25	24.00	4.00
instance n=50 450.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 451.alb	1	0	Optimal	0.06	8	8.00	0.00
instance n=50 452.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 453.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 454.alb	1	0	Optimal	0.07	8	8.00	0.00
instance n=50 455.alb	1	0	Optimal	0.03	6	6.00	0.00
instance n=50 456.alb	1	0	Optimal	0.06	8	8.00	0.00
instance n=50 457.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 458.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 459.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 46.alb	1	0	Optimal	25.75	28	28.00	0.00
instance n=50 460.alb	1	0	Optimal	0.02	7	7.00	0.00
instance n=50 461.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=50 462.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 463.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 464.alb	1	0	Optimal	0.01	6	6.00	0.00
instance n=50 465.alb	1	0	Optimal	0.03	8	8.00	0.00
instance n=50 466.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 467.alb	1	0	Optimal	0.04	9	9.00	0.00
instance n=50 468.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 469.alb	1	0	Optimal	0.07	8	8.00	0.00
instance n=50 47.alb	1	0	Optimal	3.90	28	28.00	0.00
instance n=50 470.alb	1	0	Optimal	0.06	8	8.00	0.00
instance n=50 471.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 472.alb	1	0	Optimal	0.07	8	8.00	0.00
instance n=50 473.alb	1	0	Optimal	0.03	7	7.00	0.00
instance n=50 474.alb	1	0	Optimal	0.01	7	7.00	0.00
instance n=50 475.alb	1	0	Optimal	0.06	6	6.00	0.00
instance n=50 476.alb	1	0	Optimal	0.07	28	28.00	0.00
instance n=50 477.alb	1	0	Optimal	0.10	29	29.00	0.00
instance n=50 478.alb	1	0	Optimal	0.12	32	32.00	0.00
instance n=50 479.alb	1	0	Optimal	0.06	28	28.00	0.00
instance n=50 48.alb	1	0	Optimal	30.02	27	27.00	0.00
instance n=50 480.alb	1	0	Optimal	0.04	34	34.00	0.00
instance n=50 481.alb	1	0	Optimal	0.06	28	28.00	0.00
instance n=50 482.alb	1	0	Optimal	0.06	27	27.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 483.alb	1	0	Optimal	0.09	30	30.00	0.00
instance n=50 484.alb	1	0	Optimal	0.04	32	32.00	0.00
instance n=50 485.alb	1	0	Optimal	0.09	31	31.00	0.00
instance n=50 486.alb	1	0	Optimal	0.06	32	32.00	0.00
instance n=50 487.alb	1	0	Optimal	0.10	31	31.00	0.00
instance n=50 488.alb	1	0	Optimal	0.06	31	31.00	0.00
instance n=50 489.alb	1	0	Optimal	0.05	35	35.00	0.00
instance n=50 49.alb	1	0	Optimal	0.48	25	25.00	0.00
instance n=50 490.alb	1	0	Optimal	0.04	29	29.00	0.00
instance n=50 491.alb	1	0	Optimal	0.05	35	35.00	0.00
instance n=50 492.alb	1	0	Optimal	0.03	29	29.00	0.00
instance n=50 493.alb	1	0	Optimal	0.12	30	30.00	0.00
instance n=50 494.alb	1	0	Optimal	0.08	32	32.00	0.00
instance n=50 495.alb	1	0	Optimal	0.04	34	34.00	0.00
instance n=50 496.alb	1	0	Optimal	0.09	29	29.00	0.00
instance n=50 497.alb	1	0	Optimal	0.12	30	30.00	0.00
instance n=50 498.alb	1	0	Optimal	0.06	30	30.00	0.00
instance n=50 499.alb	1	0	Optimal	0.07	33	33.00	0.00
instance n=50 5.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 50.alb	1	0	Solution	30.11	27	26.00	3.70
instance n=50 500.alb	1	0	Optimal	0.06	34	34.00	0.00
instance n=50 501.alb	1	0	Optimal	0.06	12	12.00	0.00
instance n=50 502.alb	1	0	Optimal	0.04	10	10.00	0.00
instance n=50 503.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 504.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 505.alb	1	0	Optimal	0.06	12	12.00	0.00
instance n=50 506.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 507.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 508.alb	1	0	Optimal	0.06	14	14.00	0.00
instance n=50 509.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 51.alb	1	0	Optimal	0.56	12	12.00	0.00
instance n=50 510.alb	1	0	Optimal	0.07	11	11.00	0.00
instance n=50 511.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 512.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 513.alb	1	0	Optimal	0.06	12	12.00	0.00
instance n=50 514.alb	1	0	Optimal	0.06	12	12.00	0.00
instance n=50 515.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 516.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 517.alb	1	0	Optimal	0.04	14	14.00	0.00
instance n=50 518.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 519.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=50 52.alb	1	0	Optimal	0.15	11	11.00	0.00
instance n=50 520.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 521.alb	1	0	Optimal	0.04	10	10.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 522.alb	1	0	Optimal	0.07	11	11.00	0.00
instance n=50 523.alb	1	0	Optimal	0.06	11	11.00	0.00
instance n=50 524.alb	1	0	Optimal	0.07	14	14.00	0.00
instance n=50 525.alb	1	0	Optimal	0.07	11	11.00	0.00
instance n=50 53.alb	1	0	Solution	30.18	13	12.00	7.69
instance n=50 54.alb	1	0	Optimal	0.05	11	11.00	0.00
instance n=50 55.alb	1	0	Optimal	0.06	13	13.00	0.00
instance n=50 56.alb	1	0	Optimal	1.03	11	11.00	0.00
instance n=50 57.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 58.alb	1	0	Optimal	0.12	11	11.00	0.00
instance n=50 59.alb	1	0	Optimal	0.28	11	11.00	0.00
instance n=50 6.alb	1	0	Optimal	0.38	6	6.00	0.00
instance n=50 60.alb	1	0	Optimal	26.65	12	12.00	0.00
instance n=50 61.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 62.alb	1	0	Optimal	0.04	13	13.00	0.00
instance n=50 63.alb	1	0	Optimal	0.24	12	12.00	0.00
instance n=50 64.alb	1	0	Optimal	0.05	13	13.00	0.00
instance n=50 65.alb	1	0	Optimal	0.04	12	12.00	0.00
instance n=50 66.alb	1	0	Optimal	0.77	12	12.00	0.00
instance n=50 67.alb	1	0	Optimal	0.29	12	12.00	0.00
instance n=50 68.alb	1	0	Optimal	0.07	12	12.00	0.00
instance n=50 69.alb	1	0	Optimal	0.31	12	12.00	0.00
instance n=50 7.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 70.alb	1	0	Optimal	0.04	10	10.00	0.00
instance n=50 71.alb	1	0	Optimal	0.12	13	13.00	0.00
instance n=50 72.alb	1	0	Optimal	30.02	11	11.00	0.00
instance n=50 73.alb	1	0	Optimal	0.04	11	11.00	0.00
instance n=50 74.alb	1	0	Optimal	30.01	12	12.00	0.00
instance n=50 75.alb	1	0	Optimal	0.31	11	11.00	0.00
instance n=50 76.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 77.alb	1	0	Optimal	0.07	7	7.00	0.00
instance n=50 78.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 79.alb	1	0	Optimal	0.09	8	8.00	0.00
instance n=50 8.alb	1	0	Optimal	4.94	7	7.00	0.00
instance n=50 80.alb	1	0	Optimal	0.05	7	7.00	0.00
instance n=50 81.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 82.alb	1	0	Optimal	0.04	6	6.00	0.00
instance n=50 83.alb	1	0	Optimal	0.06	8	8.00	0.00
instance n=50 84.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 85.alb	1	0	Optimal	0.04	8	8.00	0.00
instance n=50 86.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 87.alb	1	0	Optimal	0.12	8	8.00	0.00
instance n=50 88.alb	1	0	Optimal	0.05	8	8.00	0.00
instance n=50 89.alb	1	0	Optimal	0.04	7	7.00	0.00

Table 6.2: Results for SALBP-1 Problems (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 9.alb	1	0	Optimal	1.17	9	9.00	0.00
instance n=50 90.alb	1	0	Optimal	0.23	7	7.00	0.00
instance n=50 91.alb	1	0	Optimal	3.43	7	7.00	0.00
instance n=50 92.alb	1	0	Optimal	0.25	7	7.00	0.00
instance n=50 93.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 94.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 95.alb	1	0	Optimal	0.04	7	7.00	0.00
instance n=50 96.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 97.alb	1	0	Optimal	0.06	7	7.00	0.00
instance n=50 98.alb	1	0	Optimal	0.12	8	8.00	0.00
instance n=50 99.alb	1	0	Optimal	2.41	7	7.00	0.00

6.3 Results for MiniZinc/Cplex

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 1.alb	1	0	Solution	120.54	24	0.00	0.00
instance n=100 106.alb	1	0	Solution	120.53	41	0.00	0.00
instance n=100 11.alb	1	0	Solution	120.52	53	0.00	0.00
instance n=100 110.alb	1	0	Solution	120.53	45	0.00	0.00
instance n=100 113.alb	1	0	Solution	120.52	34	0.00	0.00
instance n=100 115.alb	1	0	Solution	120.45	20	0.00	0.00
instance n=100 118.alb	1	0	Solution	120.51	43	0.00	0.00
instance n=100 12.alb	1	0	Solution	120.44	27	0.00	0.00
instance n=100 122.alb	1	0	Solution	120.55	41	0.00	0.00
instance n=100 125.alb	1	0	Solution	120.51	48	0.00	0.00
instance n=100 126.alb	1	0	Solution	120.46	77	0.00	0.00
instance n=100 127.alb	1	0	Solution	120.45	78	0.00	0.00
instance n=100 128.alb	1	0	Solution	120.50	70	0.00	0.00
instance n=100 129.alb	1	0	Solution	120.49	67	0.00	0.00
instance n=100 13.alb	1	0	Solution	120.52	25	0.00	0.00
instance n=100 130.alb	1	0	Solution	120.50	79	0.00	0.00
instance n=100 131.alb	1	0	Solution	120.46	69	0.00	0.00
instance n=100 132.alb	1	0	Solution	120.46	70	0.00	0.00
instance n=100 133.alb	1	0	Solution	120.46	86	0.00	0.00
instance n=100 134.alb	1	0	Solution	120.47	72	0.00	0.00
instance n=100 135.alb	1	0	Solution	120.48	71	0.00	0.00
instance n=100 136.alb	1	0	Solution	120.46	72	0.00	0.00
instance n=100 137.alb	1	0	Solution	120.48	75	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 138.alb	1	0	Solution	120.49	70	0.00	0.00
instance n=100 139.alb	1	0	Solution	120.47	70	0.00	0.00
instance n=100 140.alb	1	0	Solution	120.52	65	0.00	0.00
instance n=100 141.alb	1	0	Solution	120.50	70	0.00	0.00
instance n=100 142.alb	1	0	Solution	120.47	68	0.00	0.00
instance n=100 143.alb	1	0	Solution	120.46	84	0.00	0.00
instance n=100 144.alb	1	0	Solution	120.47	59	0.00	0.00
instance n=100 146.alb	1	0	Solution	120.46	63	0.00	0.00
instance n=100 147.alb	1	0	Solution	120.45	73	0.00	0.00
instance n=100 148.alb	1	0	Solution	120.47	65	0.00	0.00
instance n=100 149.alb	1	0	Solution	120.47	69	0.00	0.00
instance n=100 15.alb	1	0	Solution	120.51	93	0.00	0.00
instance n=100 150.alb	1	0	Solution	120.47	72	0.00	0.00
instance n=100 156.alb	1	0	Solution	120.56	97	0.00	0.00
instance n=100 157.alb	1	0	Solution	120.42	60	0.00	0.00
instance n=100 16.alb	1	0	Solution	120.47	43	0.00	0.00
instance n=100 164.alb	1	0	Solution	120.63	53	0.00	0.00
instance n=100 170.alb	1	0	Solution	120.56	52	0.00	0.00
instance n=100 171.alb	1	0	Solution	120.52	25	0.00	0.00
instance n=100 173.alb	1	0	Solution	120.59	26	0.00	0.00
instance n=100 175.alb	1	0	Solution	120.46	100	0.00	0.00
instance n=100 176.alb	1	0	Solution	120.52	14	0.00	0.00
instance n=100 177.alb	1	0	Solution	120.51	19	0.00	0.00
instance n=100 179.alb	1	0	Solution	120.50	16	0.00	0.00
instance n=100 180.alb	1	0	Solution	120.53	15	0.00	0.00
instance n=100 181.alb	1	0	Solution	120.55	14	0.00	0.00
instance n=100 182.alb	1	0	Solution	120.50	15	0.00	0.00
instance n=100 183.alb	1	0	Solution	120.60	31	0.00	0.00
instance n=100 186.alb	1	0	Solution	120.53	15	0.00	0.00
instance n=100 187.alb	1	0	Solution	120.51	14	0.00	0.00
instance n=100 190.alb	1	0	Solution	120.58	14	0.00	0.00
instance n=100 191.alb	1	0	Solution	120.50	14	0.00	0.00
instance n=100 192.alb	1	0	Solution	120.55	14	0.00	0.00
instance n=100 193.alb	1	0	Solution	120.58	62	0.00	0.00
instance n=100 195.alb	1	0	Solution	120.52	36	0.00	0.00
instance n=100 196.alb	1	0	Solution	120.47	15	0.00	0.00
instance n=100 197.alb	1	0	Solution	120.51	100	0.00	0.00
instance n=100 198.alb	1	0	Solution	120.43	37	0.00	0.00
instance n=100 199.alb	1	0	Solution	120.53	20	0.00	0.00
instance n=100 201.alb	1	0	Solution	120.51	72	0.00	0.00
instance n=100 202.alb	1	0	Solution	120.45	100	0.00	0.00
instance n=100 205.alb	1	0	Solution	120.52	75	0.00	0.00
instance n=100 209.alb	1	0	Solution	120.49	73	0.00	0.00
instance n=100 21.alb	1	0	Solution	120.47	22	0.00	0.00
instance n=100 210.alb	1	0	Solution	120.47	65	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 211.alb	1	0	Solution	120.49	79	0.00	0.00
instance n=100 212.alb	1	0	Solution	120.60	69	0.00	0.00
instance n=100 213.alb	1	0	Solution	120.48	74	0.00	0.00
instance n=100 214.alb	1	0	Solution	120.50	71	0.00	0.00
instance n=100 217.alb	1	0	Solution	120.49	70	0.00	0.00
instance n=100 218.alb	1	0	Solution	120.50	65	0.00	0.00
instance n=100 219.alb	1	0	Solution	120.48	77	0.00	0.00
instance n=100 220.alb	1	0	Solution	120.48	88	0.00	0.00
instance n=100 221.alb	1	0	Solution	120.49	97	0.00	0.00
instance n=100 222.alb	1	0	Solution	120.51	82	0.00	0.00
instance n=100 225.alb	1	0	Solution	120.49	74	0.00	0.00
instance n=100 232.alb	1	0	Solution	120.45	99	0.00	0.00
instance n=100 235.alb	1	0	Solution	120.42	54	0.00	0.00
instance n=100 236.alb	1	0	Solution	120.53	25	0.00	0.00
instance n=100 239.alb	1	0	Solution	120.47	36	0.00	0.00
instance n=100 24.alb	1	0	Solution	120.53	42	0.00	0.00
instance n=100 246.alb	1	0	Solution	120.44	89	0.00	0.00
instance n=100 248.alb	1	0	Solution	120.52	36	0.00	0.00
instance n=100 25.alb	1	0	Solution	120.47	25	0.00	0.00
instance n=100 251.alb	1	0	Solution	120.47	25	0.00	0.00
instance n=100 253.alb	1	0	Solution	120.50	26	0.00	0.00
instance n=100 254.alb	1	0	Solution	120.55	42	0.00	0.00
instance n=100 255.alb	1	0	Solution	120.50	14	0.00	0.00
instance n=100 257.alb	1	0	Solution	120.47	100	0.00	0.00
instance n=100 261.alb	1	0	Solution	120.54	99	0.00	0.00
instance n=100 262.alb	1	0	Solution	120.52	100	0.00	0.00
instance n=100 264.alb	1	0	Solution	120.55	41	0.00	0.00
instance n=100 265.alb	1	0	Solution	120.47	100	0.00	0.00
instance n=100 266.alb	1	0	Solution	120.54	32	0.00	0.00
instance n=100 267.alb	1	0	Solution	120.47	25	0.00	0.00
instance n=100 268.alb	1	0	Solution	120.74	15	0.00	0.00
instance n=100 27.alb	1	0	Solution	120.54	35	0.00	0.00
instance n=100 270.alb	1	0	Solution	120.49	99	0.00	0.00
instance n=100 271.alb	1	0	Solution	120.43	39	0.00	0.00
instance n=100 275.alb	1	0	Solution	120.52	100	0.00	0.00
instance n=100 276.alb	1	0	Solution	120.50	69	0.00	0.00
instance n=100 277.alb	1	0	Solution	120.45	70	0.00	0.00
instance n=100 278.alb	1	0	Solution	120.46	67	0.00	0.00
instance n=100 279.alb	1	0	Solution	120.45	73	0.00	0.00
instance n=100 28.alb	1	0	Solution	120.47	15	0.00	0.00
instance n=100 280.alb	1	0	Solution	120.48	67	0.00	0.00
instance n=100 281.alb	1	0	Solution	120.47	85	0.00	0.00
instance n=100 282.alb	1	0	Solution	120.48	71	0.00	0.00
instance n=100 283.alb	1	0	Solution	120.48	65	0.00	0.00
instance n=100 284.alb	1	0	Solution	120.49	72	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 285.alb	1	0	Solution	120.45	69	0.00	0.00
instance n=100 286.alb	1	0	Solution	120.48	77	0.00	0.00
instance n=100 287.alb	1	0	Solution	120.46	78	0.00	0.00
instance n=100 288.alb	1	0	Solution	120.45	67	0.00	0.00
instance n=100 289.alb	1	0	Solution	120.47	73	0.00	0.00
instance n=100 29.alb	1	0	Solution	120.48	16	0.00	0.00
instance n=100 290.alb	1	0	Solution	120.51	67	0.00	0.00
instance n=100 291.alb	1	0	Solution	120.47	72	0.00	0.00
instance n=100 292.alb	1	0	Solution	120.48	72	0.00	0.00
instance n=100 293.alb	1	0	Solution	120.50	63	0.00	0.00
instance n=100 294.alb	1	0	Solution	120.49	73	0.00	0.00
instance n=100 295.alb	1	0	Solution	120.50	73	0.00	0.00
instance n=100 296.alb	1	0	Solution	120.47	69	0.00	0.00
instance n=100 297.alb	1	0	Solution	120.45	68	0.00	0.00
instance n=100 298.alb	1	0	Solution	120.47	68	0.00	0.00
instance n=100 299.alb	1	0	Solution	120.46	66	0.00	0.00
instance n=100 3.alb	1	0	Solution	120.55	62	0.00	0.00
instance n=100 30.alb	1	0	Solution	120.55	71	0.00	0.00
instance n=100 300.alb	1	0	Solution	120.50	97	0.00	0.00
instance n=100 301.alb	1	0	Solution	120.49	25	0.00	0.00
instance n=100 302.alb	1	0	Solution	120.45	68	0.00	0.00
instance n=100 303.alb	1	0	Solution	120.53	56	0.00	0.00
instance n=100 304.alb	1	0	Solution	120.48	54	0.00	0.00
instance n=100 308.alb	1	0	Solution	120.52	22	0.00	0.00
instance n=100 312.alb	1	0	Solution	120.53	44	0.00	0.00
instance n=100 314.alb	1	0	Solution	120.53	100	0.00	0.00
instance n=100 32.alb	1	0	Solution	120.54	100	0.00	0.00
instance n=100 321.alb	1	0	Solution	120.53	53	0.00	0.00
instance n=100 322.alb	1	0	Solution	120.54	46	0.00	0.00
instance n=100 323.alb	1	0	Solution	120.47	26	0.00	0.00
instance n=100 326.alb	1	0	Solution	120.47	14	0.00	0.00
instance n=100 327.alb	1	0	Solution	120.55	15	0.00	0.00
instance n=100 328.alb	1	0	Solution	120.50	100	0.00	0.00
instance n=100 329.alb	1	0	Solution	120.50	65	0.00	0.00
instance n=100 33.alb	1	0	Solution	120.56	93	0.00	0.00
instance n=100 331.alb	1	0	Solution	120.56	92	0.00	0.00
instance n=100 332.alb	1	0	Solution	120.44	14	0.00	0.00
instance n=100 333.alb	1	0	Solution	120.52	49	0.00	0.00
instance n=100 335.alb	1	0	Solution	120.45	14	0.00	0.00
instance n=100 336.alb	1	0	Solution	120.56	55	0.00	0.00
instance n=100 337.alb	1	0	Solution	120.56	14	0.00	0.00
instance n=100 338.alb	1	0	Solution	120.50	16	0.00	0.00
instance n=100 339.alb	1	0	Solution	120.48	16	0.00	0.00
instance n=100 340.alb	1	0	Solution	120.51	15	0.00	0.00
instance n=100 342.alb	1	0	Solution	120.54	100	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 344.alb	1	0	Solution	120.52	100	0.00	0.00
instance n=100 345.alb	1	0	Solution	120.60	98	0.00	0.00
instance n=100 346.alb	1	0	Solution	120.54	99	0.00	0.00
instance n=100 347.alb	1	0	Solution	120.49	15	0.00	0.00
instance n=100 349.alb	1	0	Solution	120.42	14	0.00	0.00
instance n=100 35.alb	1	0	Solution	120.45	16	0.00	0.00
instance n=100 350.alb	1	0	Solution	120.52	36	0.00	0.00
instance n=100 351.alb	1	0	Solution	120.47	98	0.00	0.00
instance n=100 352.alb	1	0	Solution	120.47	82	0.00	0.00
instance n=100 354.alb	1	0	Solution	120.53	67	0.00	0.00
instance n=100 355.alb	1	0	Solution	120.47	68	0.00	0.00
instance n=100 357.alb	1	0	Solution	120.48	79	0.00	0.00
instance n=100 358.alb	1	0	Solution	120.51	100	0.00	0.00
instance n=100 359.alb	1	0	Solution	120.48	99	0.00	0.00
instance n=100 362.alb	1	0	Solution	120.47	98	0.00	0.00
instance n=100 363.alb	1	0	Solution	120.47	65	0.00	0.00
instance n=100 364.alb	1	0	Solution	120.45	79	0.00	0.00
instance n=100 365.alb	1	0	Solution	120.49	76	0.00	0.00
instance n=100 366.alb	1	0	Solution	120.47	88	0.00	0.00
instance n=100 367.alb	1	0	Solution	120.49	82	0.00	0.00
instance n=100 368.alb	1	0	Solution	120.47	100	0.00	0.00
instance n=100 370.alb	1	0	Solution	120.47	91	0.00	0.00
instance n=100 371.alb	1	0	Solution	120.46	100	0.00	0.00
instance n=100 375.alb	1	0	Solution	120.50	81	0.00	0.00
instance n=100 38.alb	1	0	Solution	120.50	16	0.00	0.00
instance n=100 382.alb	1	0	Solution	120.51	61	0.00	0.00
instance n=100 383.alb	1	0	Solution	120.53	54	0.00	0.00
instance n=100 39.alb	1	0	Solution	120.52	30	0.00	0.00
instance n=100 390.alb	1	0	Solution	120.58	67	0.00	0.00
instance n=100 392.alb	1	0	Solution	120.57	47	0.00	0.00
instance n=100 397.alb	1	0	Solution	120.45	57	0.00	0.00
instance n=100 40.alb	1	0	Solution	120.58	57	0.00	0.00
instance n=100 400.alb	1	0	Solution	120.46	31	0.00	0.00
instance n=100 403.alb	1	0	Solution	120.63	99	0.00	0.00
instance n=100 404.alb	1	0	Solution	120.49	56	0.00	0.00
instance n=100 405.alb	1	0	Solution	120.49	14	0.00	0.00
instance n=100 406.alb	1	0	Solution	120.50	14	0.00	0.00
instance n=100 408.alb	1	0	Solution	120.51	90	0.00	0.00
instance n=100 414.alb	1	0	Solution	120.51	47	0.00	0.00
instance n=100 415.alb	1	0	Solution	120.51	99	0.00	0.00
instance n=100 416.alb	1	0	Solution	120.52	52	0.00	0.00
instance n=100 420.alb	1	0	Solution	120.53	37	0.00	0.00
instance n=100 421.alb	1	0	Solution	120.57	14	0.00	0.00
instance n=100 422.alb	1	0	Solution	120.52	39	0.00	0.00
instance n=100 423.alb	1	0	Solution	120.52	42	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 424.alb	1	0	Solution	120.51	57	0.00	0.00
instance n=100 425.alb	1	0	Solution	120.50	98	0.00	0.00
instance n=100 426.alb	1	0	Solution	120.46	74	0.00	0.00
instance n=100 427.alb	1	0	Solution	120.48	78	0.00	0.00
instance n=100 428.alb	1	0	Solution	120.47	69	0.00	0.00
instance n=100 429.alb	1	0	Solution	120.46	73	0.00	0.00
instance n=100 43.alb	1	0	Solution	120.55	15	0.00	0.00
instance n=100 430.alb	1	0	Solution	120.48	68	0.00	0.00
instance n=100 431.alb	1	0	Solution	120.48	68	0.00	0.00
instance n=100 432.alb	1	0	Solution	120.47	74	0.00	0.00
instance n=100 433.alb	1	0	Solution	120.47	65	0.00	0.00
instance n=100 434.alb	1	0	Solution	120.45	70	0.00	0.00
instance n=100 435.alb	1	0	Solution	120.47	69	0.00	0.00
instance n=100 436.alb	1	0	Solution	120.46	66	0.00	0.00
instance n=100 437.alb	1	0	Solution	120.46	66	0.00	0.00
instance n=100 438.alb	1	0	Solution	120.47	66	0.00	0.00
instance n=100 439.alb	1	0	Solution	120.48	79	0.00	0.00
instance n=100 44.alb	1	0	Solution	120.53	37	0.00	0.00
instance n=100 440.alb	1	0	Solution	120.46	63	0.00	0.00
instance n=100 441.alb	1	0	Solution	120.44	66	0.00	0.00
instance n=100 442.alb	1	0	Solution	120.46	68	0.00	0.00
instance n=100 443.alb	1	0	Solution	120.51	66	0.00	0.00
instance n=100 444.alb	1	0	Solution	120.46	99	0.00	0.00
instance n=100 445.alb	1	0	Solution	120.47	65	0.00	0.00
instance n=100 446.alb	1	0	Solution	120.48	73	0.00	0.00
instance n=100 447.alb	1	0	Solution	120.47	64	0.00	0.00
instance n=100 448.alb	1	0	Solution	120.53	84	0.00	0.00
instance n=100 449.alb	1	0	Solution	120.44	71	0.00	0.00
instance n=100 45.alb	1	0	Solution	120.52	95	0.00	0.00
instance n=100 450.alb	1	0	Solution	120.47	68	0.00	0.00
instance n=100 451.alb	1	0	Solution	120.44	30	0.00	0.00
instance n=100 452.alb	1	0	Solution	120.47	24	0.00	0.00
instance n=100 456.alb	1	0	Solution	120.44	29	0.00	0.00
instance n=100 46.alb	1	0	Solution	120.53	14	0.00	0.00
instance n=100 460.alb	1	0	Solution	120.43	26	0.00	0.00
instance n=100 461.alb	1	0	Solution	120.46	31	0.00	0.00
instance n=100 463.alb	1	0	Solution	120.45	28	0.00	0.00
instance n=100 464.alb	1	0	Solution	120.43	31	0.00	0.00
instance n=100 465.alb	1	0	Solution	120.46	30	0.00	0.00
instance n=100 466.alb	1	0	Solution	120.42	39	0.00	0.00
instance n=100 468.alb	1	0	Solution	120.43	32	0.00	0.00
instance n=100 469.alb	1	0	Solution	120.45	24	0.00	0.00
instance n=100 471.alb	1	0	Solution	120.44	88	0.00	0.00
instance n=100 472.alb	1	0	Solution	120.52	32	0.00	0.00
instance n=100 474.alb	1	0	Solution	120.43	25	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 476.alb	1	0	Solution	120.51	15	0.00	0.00
instance n=100 48.alb	1	0	Solution	120.54	16	0.00	0.00
instance n=100 483.alb	1	0	Solution	120.49	26	0.00	0.00
instance n=100 485.alb	1	0	Solution	120.49	20	0.00	0.00
instance n=100 489.alb	1	0	Solution	120.51	33	0.00	0.00
instance n=100 49.alb	1	0	Solution	120.52	15	0.00	0.00
instance n=100 491.alb	1	0	Solution	120.50	28	0.00	0.00
instance n=100 492.alb	1	0	Solution	120.51	95	0.00	0.00
instance n=100 495.alb	1	0	Solution	120.51	18	0.00	0.00
instance n=100 496.alb	1	0	Solution	120.51	24	0.00	0.00
instance n=100 497.alb	1	0	Solution	120.46	64	0.00	0.00
instance n=100 499.alb	1	0	Solution	120.53	25	0.00	0.00
instance n=100 5.alb	1	0	Solution	120.48	24	0.00	0.00
instance n=100 50.alb	1	0	Solution	120.49	14	0.00	0.00
instance n=100 500.alb	1	0	Solution	120.49	17	0.00	0.00
instance n=100 501.alb	1	0	Solution	120.46	67	0.00	0.00
instance n=100 502.alb	1	0	Solution	120.45	69	0.00	0.00
instance n=100 503.alb	1	0	Solution	120.45	65	0.00	0.00
instance n=100 504.alb	1	0	Solution	120.46	64	0.00	0.00
instance n=100 505.alb	1	0	Solution	120.47	63	0.00	0.00
instance n=100 506.alb	1	0	Solution	120.51	64	0.00	0.00
instance n=100 507.alb	1	0	Solution	120.47	62	0.00	0.00
instance n=100 508.alb	1	0	Solution	120.43	61	0.00	0.00
instance n=100 509.alb	1	0	Solution	120.47	63	0.00	0.00
instance n=100 510.alb	1	0	Solution	120.46	63	0.00	0.00
instance n=100 511.alb	1	0	Solution	120.46	61	0.00	0.00
instance n=100 512.alb	1	0	Solution	120.45	66	0.00	0.00
instance n=100 513.alb	1	0	Solution	120.45	64	0.00	0.00
instance n=100 514.alb	1	0	Solution	120.53	66	0.00	0.00
instance n=100 515.alb	1	0	Solution	120.47	65	0.00	0.00
instance n=100 516.alb	1	0	Solution	120.47	78	0.00	0.00
instance n=100 517.alb	1	0	Solution	120.45	64	0.00	0.00
instance n=100 518.alb	1	0	Solution	121.01	67	0.00	0.00
instance n=100 519.alb	1	0	Solution	120.47	69	0.00	0.00
instance n=100 52.alb	1	0	Solution	120.50	71	0.00	0.00
instance n=100 520.alb	1	0	Solution	120.44	64	0.00	0.00
instance n=100 521.alb	1	0	Solution	120.45	75	0.00	0.00
instance n=100 522.alb	1	0	Solution	120.47	65	0.00	0.00
instance n=100 523.alb	1	0	Solution	120.46	61	0.00	0.00
instance n=100 524.alb	1	0	Solution	120.88	68	0.00	0.00
instance n=100 525.alb	1	0	Solution	120.43	66	0.00	0.00
instance n=100 53.alb	1	0	Solution	120.48	88	0.00	0.00
instance n=100 56.alb	1	0	Solution	120.48	68	0.00	0.00
instance n=100 57.alb	1	0	Solution	120.49	100	0.00	0.00
instance n=100 58.alb	1	0	Solution	120.50	86	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 59.alb	1	0	Solution	120.46	84	0.00	0.00
instance n=100 61.alb	1	0	Solution	120.48	76	0.00	0.00
instance n=100 62.alb	1	0	Solution	120.48	100	0.00	0.00
instance n=100 64.alb	1	0	Solution	120.51	71	0.00	0.00
instance n=100 65.alb	1	0	Solution	120.46	66	0.00	0.00
instance n=100 66.alb	1	0	Solution	120.46	78	0.00	0.00
instance n=100 68.alb	1	0	Solution	120.47	99	0.00	0.00
instance n=100 69.alb	1	0	Solution	120.50	81	0.00	0.00
instance n=100 71.alb	1	0	Solution	120.51	95	0.00	0.00
instance n=100 72.alb	1	0	Solution	120.47	77	0.00	0.00
instance n=100 73.alb	1	0	Solution	120.49	71	0.00	0.00
instance n=100 75.alb	1	0	Solution	120.47	85	0.00	0.00
instance n=100 78.alb	1	0	Solution	120.52	65	0.00	0.00
instance n=100 80.alb	1	0	Solution	120.44	99	0.00	0.00
instance n=100 84.alb	1	0	Solution	120.48	45	0.00	0.00
instance n=100 89.alb	1	0	Solution	120.43	73	0.00	0.00
instance n=100 9.alb	1	0	Solution	120.48	25	0.00	0.00
instance n=100 94.alb	1	0	Solution	120.46	57	0.00	0.00
instance n=100 96.alb	1	0	Solution	120.44	100	0.00	0.00
instance n=20 1.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 10.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 100.alb	1	0	Optimal	0.38	11	0.00	0.00
instance n=20 101.alb	1	0	Optimal	1.07	13	0.00	0.00
instance n=20 102.alb	1	0	Optimal	0.55	13	0.00	0.00
instance n=20 103.alb	1	0	Optimal	0.49	12	0.00	0.00
instance n=20 104.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 105.alb	1	0	Optimal	0.38	12	0.00	0.00
instance n=20 106.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 107.alb	1	0	Optimal	0.37	14	0.00	0.00
instance n=20 108.alb	1	0	Optimal	0.41	15	0.00	0.00
instance n=20 109.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=20 11.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 110.alb	1	0	Optimal	0.34	11	0.00	0.00
instance n=20 111.alb	1	0	Optimal	0.39	13	0.00	0.00
instance n=20 112.alb	1	0	Optimal	0.37	11	0.00	0.00
instance n=20 113.alb	1	0	Optimal	0.44	12	0.00	0.00
instance n=20 114.alb	1	0	Optimal	0.44	13	0.00	0.00
instance n=20 115.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 116.alb	1	0	Optimal	0.37	5	0.00	0.00
instance n=20 117.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 118.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 119.alb	1	0	Optimal	0.37	6	0.00	0.00
instance n=20 12.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 120.alb	1	0	Optimal	0.33	6	0.00	0.00
instance n=20 121.alb	1	0	Optimal	0.32	5	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 122.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 123.alb	1	0	Optimal	0.31	5	0.00	0.00
instance n=20 124.alb	1	0	Optimal	0.32	5	0.00	0.00
instance n=20 125.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 126.alb	1	0	Optimal	0.31	5	0.00	0.00
instance n=20 127.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 128.alb	1	0	Optimal	0.32	5	0.00	0.00
instance n=20 129.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 13.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 130.alb	1	0	Optimal	0.33	6	0.00	0.00
instance n=20 131.alb	1	0	Optimal	0.39	7	0.00	0.00
instance n=20 132.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 133.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 134.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 135.alb	1	0	Optimal	0.36	6	0.00	0.00
instance n=20 136.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 137.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 138.alb	1	0	Optimal	0.36	5	0.00	0.00
instance n=20 139.alb	1	0	Optimal	0.36	5	0.00	0.00
instance n=20 14.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 140.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 141.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 142.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 143.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 144.alb	1	0	Optimal	0.31	4	0.00	0.00
instance n=20 145.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 146.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 147.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 148.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 149.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 15.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 150.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 151.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 152.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 153.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 154.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 155.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 156.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 157.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 158.alb	1	0	Optimal	0.34	3	0.00	0.00
instance n=20 159.alb	1	0	Optimal	0.30	3	0.00	0.00
instance n=20 16.alb	1	0	Optimal	0.38	12	0.00	0.00
instance n=20 160.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 161.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 162.alb	1	0	Optimal	0.32	3	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 163.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 164.alb	1	0	Optimal	0.31	4	0.00	0.00
instance n=20 165.alb	1	0	Optimal	0.34	3	0.00	0.00
instance n=20 166.alb	1	0	Optimal	0.43	12	0.00	0.00
instance n=20 167.alb	1	0	Optimal	0.41	11	0.00	0.00
instance n=20 168.alb	1	0	Optimal	0.37	10	0.00	0.00
instance n=20 169.alb	1	0	Optimal	0.49	11	0.00	0.00
instance n=20 17.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 170.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 171.alb	1	0	Optimal	0.52	13	0.00	0.00
instance n=20 172.alb	1	0	Optimal	0.38	11	0.00	0.00
instance n=20 173.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 174.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=20 175.alb	1	0	Optimal	0.38	10	0.00	0.00
instance n=20 176.alb	1	0	Optimal	0.44	11	0.00	0.00
instance n=20 177.alb	1	0	Optimal	0.69	10	0.00	0.00
instance n=20 178.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 179.alb	1	0	Optimal	0.53	11	0.00	0.00
instance n=20 18.alb	1	0	Optimal	0.45	11	0.00	0.00
instance n=20 180.alb	1	0	Optimal	0.46	13	0.00	0.00
instance n=20 181.alb	1	0	Optimal	0.52	11	0.00	0.00
instance n=20 182.alb	1	0	Optimal	0.38	11	0.00	0.00
instance n=20 183.alb	1	0	Optimal	0.48	13	0.00	0.00
instance n=20 184.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=20 185.alb	1	0	Optimal	0.41	15	0.00	0.00
instance n=20 186.alb	1	0	Optimal	0.83	14	0.00	0.00
instance n=20 187.alb	1	0	Optimal	0.38	10	0.00	0.00
instance n=20 188.alb	1	0	Optimal	0.38	11	0.00	0.00
instance n=20 189.alb	1	0	Optimal	0.44	13	0.00	0.00
instance n=20 19.alb	1	0	Optimal	0.46	14	0.00	0.00
instance n=20 190.alb	1	0	Optimal	0.46	15	0.00	0.00
instance n=20 191.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 192.alb	1	0	Optimal	0.39	5	0.00	0.00
instance n=20 193.alb	1	0	Optimal	0.36	5	0.00	0.00
instance n=20 194.alb	1	0	Optimal	0.33	6	0.00	0.00
instance n=20 195.alb	1	0	Optimal	0.33	6	0.00	0.00
instance n=20 196.alb	1	0	Optimal	0.38	5	0.00	0.00
instance n=20 197.alb	1	0	Optimal	0.36	4	0.00	0.00
instance n=20 198.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 199.alb	1	0	Optimal	0.37	5	0.00	0.00
instance n=20 2.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 20.alb	1	0	Optimal	0.38	11	0.00	0.00
instance n=20 200.alb	1	0	Optimal	0.37	6	0.00	0.00
instance n=20 201.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 202.alb	1	0	Optimal	0.35	4	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 203.alb	1	0	Optimal	0.36	4	0.00	0.00
instance n=20 204.alb	1	0	Optimal	0.31	5	0.00	0.00
instance n=20 205.alb	1	0	Optimal	0.36	6	0.00	0.00
instance n=20 206.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 207.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 208.alb	1	0	Optimal	0.36	5	0.00	0.00
instance n=20 209.alb	1	0	Optimal	0.37	4	0.00	0.00
instance n=20 21.alb	1	0	Optimal	0.42	14	0.00	0.00
instance n=20 210.alb	1	0	Optimal	0.37	5	0.00	0.00
instance n=20 211.alb	1	0	Optimal	0.36	5	0.00	0.00
instance n=20 212.alb	1	0	Optimal	0.32	5	0.00	0.00
instance n=20 213.alb	1	0	Optimal	0.36	5	0.00	0.00
instance n=20 214.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 215.alb	1	0	Optimal	0.38	5	0.00	0.00
instance n=20 216.alb	1	0	Optimal	0.34	3	0.00	0.00
instance n=20 217.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 218.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 219.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 22.alb	1	0	Optimal	0.42	12	0.00	0.00
instance n=20 220.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 221.alb	1	0	Optimal	0.34	3	0.00	0.00
instance n=20 222.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 223.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 224.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 225.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 226.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 227.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 228.alb	1	0	Optimal	0.31	2	0.00	0.00
instance n=20 229.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 23.alb	1	0	Optimal	0.60	13	0.00	0.00
instance n=20 230.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 231.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 232.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 233.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 234.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 235.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 236.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 237.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 238.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 239.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 24.alb	1	0	Optimal	0.38	11	0.00	0.00
instance n=20 240.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 241.alb	1	0	Optimal	0.47	13	0.00	0.00
instance n=20 242.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=20 243.alb	1	0	Optimal	0.39	10	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 244.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 245.alb	1	0	Optimal	0.38	13	0.00	0.00
instance n=20 246.alb	1	0	Optimal	0.37	13	0.00	0.00
instance n=20 247.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 248.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 249.alb	1	0	Optimal	0.44	13	0.00	0.00
instance n=20 25.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 250.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 251.alb	1	0	Optimal	0.37	12	0.00	0.00
instance n=20 252.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 253.alb	1	0	Optimal	0.58	13	0.00	0.00
instance n=20 254.alb	1	0	Optimal	0.40	12	0.00	0.00
instance n=20 255.alb	1	0	Optimal	0.39	13	0.00	0.00
instance n=20 256.alb	1	0	Optimal	0.40	14	0.00	0.00
instance n=20 257.alb	1	0	Optimal	0.39	10	0.00	0.00
instance n=20 258.alb	1	0	Optimal	0.40	13	0.00	0.00
instance n=20 259.alb	1	0	Optimal	0.40	13	0.00	0.00
instance n=20 26.alb	1	0	Optimal	0.38	12	0.00	0.00
instance n=20 260.alb	1	0	Optimal	0.43	12	0.00	0.00
instance n=20 261.alb	1	0	Optimal	0.41	12	0.00	0.00
instance n=20 262.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 263.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=20 264.alb	1	0	Optimal	0.41	12	0.00	0.00
instance n=20 265.alb	1	0	Optimal	0.44	12	0.00	0.00
instance n=20 266.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 267.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 268.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 269.alb	1	0	Optimal	0.38	7	0.00	0.00
instance n=20 27.alb	1	0	Optimal	0.49	13	0.00	0.00
instance n=20 270.alb	1	0	Optimal	0.35	7	0.00	0.00
instance n=20 271.alb	1	0	Optimal	0.33	6	0.00	0.00
instance n=20 272.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 273.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 274.alb	1	0	Optimal	0.38	6	0.00	0.00
instance n=20 275.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 276.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 277.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 278.alb	1	0	Optimal	0.37	6	0.00	0.00
instance n=20 279.alb	1	0	Optimal	0.36	6	0.00	0.00
instance n=20 28.alb	1	0	Optimal	0.43	12	0.00	0.00
instance n=20 280.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 281.alb	1	0	Optimal	0.34	4	0.00	0.00
instance n=20 282.alb	1	0	Optimal	0.34	4	0.00	0.00
instance n=20 283.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 284.alb	1	0	Optimal	0.35	5	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 285.alb	1	0	Optimal	0.32	5	0.00	0.00
instance n=20 286.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 287.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 288.alb	1	0	Optimal	0.33	6	0.00	0.00
instance n=20 289.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 29.alb	1	0	Optimal	0.39	10	0.00	0.00
instance n=20 290.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 291.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 292.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 293.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 294.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 295.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 296.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 297.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 298.alb	1	0	Optimal	0.30	3	0.00	0.00
instance n=20 299.alb	1	0	Optimal	0.34	3	0.00	0.00
instance n=20 3.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 30.alb	1	0	Optimal	0.54	16	0.00	0.00
instance n=20 300.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 301.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 302.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 303.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 304.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 305.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 306.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 307.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 308.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 309.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 31.alb	1	0	Optimal	0.41	12	0.00	0.00
instance n=20 310.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 311.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 312.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 313.alb	1	0	Optimal	0.35	3	0.00	0.00
instance n=20 314.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 315.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 316.alb	1	0	Optimal	0.41	10	0.00	0.00
instance n=20 317.alb	1	0	Optimal	0.44	10	0.00	0.00
instance n=20 318.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 319.alb	1	0	Optimal	0.51	14	0.00	0.00
instance n=20 32.alb	1	0	Optimal	0.42	13	0.00	0.00
instance n=20 320.alb	1	0	Optimal	0.44	12	0.00	0.00
instance n=20 321.alb	1	0	Optimal	0.55	14	0.00	0.00
instance n=20 322.alb	1	0	Optimal	0.43	12	0.00	0.00
instance n=20 323.alb	1	0	Optimal	0.43	13	0.00	0.00
instance n=20 324.alb	1	0	Optimal	0.49	9	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 325.alb	1	0	Optimal	0.44	14	0.00	0.00
instance n=20 326.alb	1	0	Optimal	0.55	14	0.00	0.00
instance n=20 327.alb	1	0	Optimal	0.55	13	0.00	0.00
instance n=20 328.alb	1	0	Optimal	0.43	13	0.00	0.00
instance n=20 329.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 33.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 330.alb	1	0	Optimal	0.44	12	0.00	0.00
instance n=20 331.alb	1	0	Optimal	0.40	13	0.00	0.00
instance n=20 332.alb	1	0	Optimal	0.38	13	0.00	0.00
instance n=20 333.alb	1	0	Optimal	0.49	11	0.00	0.00
instance n=20 334.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 335.alb	1	0	Optimal	0.45	14	0.00	0.00
instance n=20 336.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 337.alb	1	0	Optimal	0.38	10	0.00	0.00
instance n=20 338.alb	1	0	Optimal	0.54	14	0.00	0.00
instance n=20 339.alb	1	0	Optimal	0.46	13	0.00	0.00
instance n=20 34.alb	1	0	Optimal	0.70	12	0.00	0.00
instance n=20 340.alb	1	0	Optimal	0.70	11	0.00	0.00
instance n=20 341.alb	1	0	Optimal	0.36	6	0.00	0.00
instance n=20 342.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 343.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 344.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 345.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 346.alb	1	0	Optimal	0.41	5	0.00	0.00
instance n=20 347.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 348.alb	1	0	Optimal	0.39	5	0.00	0.00
instance n=20 349.alb	1	0	Optimal	0.39	5	0.00	0.00
instance n=20 35.alb	1	0	Optimal	0.45	12	0.00	0.00
instance n=20 350.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 351.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 352.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 353.alb	1	0	Optimal	0.38	6	0.00	0.00
instance n=20 354.alb	1	0	Optimal	0.37	6	0.00	0.00
instance n=20 355.alb	1	0	Optimal	0.32	5	0.00	0.00
instance n=20 356.alb	1	0	Optimal	0.39	5	0.00	0.00
instance n=20 357.alb	1	0	Optimal	0.39	5	0.00	0.00
instance n=20 358.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 359.alb	1	0	Optimal	0.31	4	0.00	0.00
instance n=20 36.alb	1	0	Optimal	0.43	13	0.00	0.00
instance n=20 360.alb	1	0	Optimal	0.36	6	0.00	0.00
instance n=20 361.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 362.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 363.alb	1	0	Optimal	0.37	7	0.00	0.00
instance n=20 364.alb	1	0	Optimal	0.31	4	0.00	0.00
instance n=20 365.alb	1	0	Optimal	0.39	5	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 366.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 367.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 368.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 369.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 37.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=20 370.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 371.alb	1	0	Optimal	0.34	3	0.00	0.00
instance n=20 372.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 373.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 374.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 375.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 376.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 377.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 378.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 379.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 38.alb	1	0	Optimal	0.41	12	0.00	0.00
instance n=20 380.alb	1	0	Optimal	0.34	3	0.00	0.00
instance n=20 381.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 382.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 383.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 384.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 385.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 386.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 387.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 388.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 389.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 39.alb	1	0	Optimal	0.42	13	0.00	0.00
instance n=20 390.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 391.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 392.alb	1	0	Optimal	0.38	14	0.00	0.00
instance n=20 393.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 394.alb	1	0	Optimal	0.42	12	0.00	0.00
instance n=20 395.alb	1	0	Optimal	0.40	12	0.00	0.00
instance n=20 396.alb	1	0	Optimal	0.44	13	0.00	0.00
instance n=20 397.alb	1	0	Optimal	0.38	10	0.00	0.00
instance n=20 398.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 399.alb	1	0	Optimal	0.42	13	0.00	0.00
instance n=20 4.alb	1	0	Optimal	0.30	3	0.00	0.00
instance n=20 40.alb	1	0	Optimal	0.38	12	0.00	0.00
instance n=20 400.alb	1	0	Optimal	0.41	12	0.00	0.00
instance n=20 401.alb	1	0	Optimal	0.46	12	0.00	0.00
instance n=20 402.alb	1	0	Optimal	0.46	12	0.00	0.00
instance n=20 403.alb	1	0	Optimal	0.42	12	0.00	0.00
instance n=20 404.alb	1	0	Optimal	0.49	10	0.00	0.00
instance n=20 405.alb	1	0	Optimal	0.40	12	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 406.alb	1	0	Optimal	0.41	14	0.00	0.00
instance n=20 407.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 408.alb	1	0	Optimal	0.52	14	0.00	0.00
instance n=20 409.alb	1	0	Optimal	0.46	12	0.00	0.00
instance n=20 41.alb	1	0	Optimal	0.36	6	0.00	0.00
instance n=20 410.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 411.alb	1	0	Optimal	0.53	15	0.00	0.00
instance n=20 412.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 413.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 414.alb	1	0	Optimal	0.50	12	0.00	0.00
instance n=20 415.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 416.alb	1	0	Optimal	0.36	6	0.00	0.00
instance n=20 417.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 418.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 419.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 42.alb	1	0	Optimal	0.39	5	0.00	0.00
instance n=20 420.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 421.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 422.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 423.alb	1	0	Optimal	0.39	6	0.00	0.00
instance n=20 424.alb	1	0	Optimal	0.36	5	0.00	0.00
instance n=20 425.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=20 426.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 427.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 428.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 429.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 43.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 430.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 431.alb	1	0	Optimal	0.38	6	0.00	0.00
instance n=20 432.alb	1	0	Optimal	0.35	5	0.00	0.00
instance n=20 433.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 434.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 435.alb	1	0	Optimal	0.38	7	0.00	0.00
instance n=20 436.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 437.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 438.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 439.alb	1	0	Optimal	0.31	5	0.00	0.00
instance n=20 44.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 440.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 441.alb	1	0	Optimal	0.34	3	0.00	0.00
instance n=20 442.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 443.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 444.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 445.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 446.alb	1	0	Optimal	0.31	3	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 447.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 448.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 449.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 45.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 450.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 451.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 452.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 453.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 454.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 455.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 456.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 457.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 458.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 459.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 46.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 460.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 461.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 462.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 463.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 464.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 465.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 466.alb	1	0	Optimal	0.32	13	0.00	0.00
instance n=20 467.alb	1	0	Optimal	0.33	14	0.00	0.00
instance n=20 468.alb	1	0	Optimal	0.37	13	0.00	0.00
instance n=20 469.alb	1	0	Optimal	0.36	14	0.00	0.00
instance n=20 47.alb	1	0	Optimal	0.31	4	0.00	0.00
instance n=20 470.alb	1	0	Optimal	0.37	12	0.00	0.00
instance n=20 471.alb	1	0	Optimal	0.36	12	0.00	0.00
instance n=20 472.alb	1	0	Optimal	0.35	13	0.00	0.00
instance n=20 473.alb	1	0	Optimal	0.32	10	0.00	0.00
instance n=20 474.alb	1	0	Optimal	0.34	14	0.00	0.00
instance n=20 475.alb	1	0	Optimal	0.33	11	0.00	0.00
instance n=20 476.alb	1	0	Optimal	0.35	11	0.00	0.00
instance n=20 477.alb	1	0	Optimal	0.34	11	0.00	0.00
instance n=20 478.alb	1	0	Optimal	0.33	12	0.00	0.00
instance n=20 479.alb	1	0	Optimal	0.32	13	0.00	0.00
instance n=20 48.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 480.alb	1	0	Optimal	0.32	13	0.00	0.00
instance n=20 481.alb	1	0	Optimal	0.34	13	0.00	0.00
instance n=20 482.alb	1	0	Optimal	0.32	13	0.00	0.00
instance n=20 483.alb	1	0	Optimal	0.36	12	0.00	0.00
instance n=20 484.alb	1	0	Optimal	0.38	13	0.00	0.00
instance n=20 485.alb	1	0	Optimal	0.34	15	0.00	0.00
instance n=20 486.alb	1	0	Optimal	0.33	11	0.00	0.00
instance n=20 487.alb	1	0	Optimal	0.34	12	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 488.alb	1	0	Optimal	0.39	15	0.00	0.00
instance n=20 489.alb	1	0	Optimal	0.35	12	0.00	0.00
instance n=20 49.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 490.alb	1	0	Optimal	0.35	12	0.00	0.00
instance n=20 491.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 492.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 493.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 494.alb	1	0	Optimal	0.33	6	0.00	0.00
instance n=20 495.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 496.alb	1	0	Optimal	0.31	5	0.00	0.00
instance n=20 497.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 498.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 499.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 5.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 50.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 500.alb	1	0	Optimal	0.32	8	0.00	0.00
instance n=20 501.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 502.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 503.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 504.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 505.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 506.alb	1	0	Optimal	0.31	5	0.00	0.00
instance n=20 507.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 508.alb	1	0	Optimal	0.32	5	0.00	0.00
instance n=20 509.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 51.alb	1	0	Optimal	0.35	4	0.00	0.00
instance n=20 510.alb	1	0	Optimal	0.36	5	0.00	0.00
instance n=20 511.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 512.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 513.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 514.alb	1	0	Optimal	0.32	5	0.00	0.00
instance n=20 515.alb	1	0	Optimal	0.32	6	0.00	0.00
instance n=20 516.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 517.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 518.alb	1	0	Optimal	0.30	3	0.00	0.00
instance n=20 519.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 52.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 520.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 521.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 522.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 523.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 524.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 525.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 53.alb	1	0	Optimal	0.34	5	0.00	0.00
instance n=20 54.alb	1	0	Optimal	0.33	5	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 55.alb	1	0	Optimal	0.31	5	0.00	0.00
instance n=20 56.alb	1	0	Optimal	0.33	4	0.00	0.00
instance n=20 57.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 58.alb	1	0	Optimal	0.31	5	0.00	0.00
instance n=20 59.alb	1	0	Optimal	0.36	4	0.00	0.00
instance n=20 6.alb	1	0	Optimal	0.30	3	0.00	0.00
instance n=20 60.alb	1	0	Optimal	0.36	6	0.00	0.00
instance n=20 61.alb	1	0	Optimal	0.38	7	0.00	0.00
instance n=20 62.alb	1	0	Optimal	0.37	5	0.00	0.00
instance n=20 63.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 64.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 65.alb	1	0	Optimal	0.33	5	0.00	0.00
instance n=20 66.alb	1	0	Optimal	0.31	3	0.00	0.00
instance n=20 67.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 68.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 69.alb	1	0	Optimal	0.30	2	0.00	0.00
instance n=20 7.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 70.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 71.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 72.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 73.alb	1	0	Optimal	0.30	2	0.00	0.00
instance n=20 74.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 75.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 76.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 77.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 78.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 79.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 8.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 80.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 81.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 82.alb	1	0	Optimal	0.32	4	0.00	0.00
instance n=20 83.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 84.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 85.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 86.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 87.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 88.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 89.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 9.alb	1	0	Optimal	0.32	3	0.00	0.00
instance n=20 90.alb	1	0	Optimal	0.33	3	0.00	0.00
instance n=20 91.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 92.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=20 93.alb	1	0	Optimal	0.38	13	0.00	0.00
instance n=20 94.alb	1	0	Optimal	0.38	10	0.00	0.00
instance n=20 95.alb	1	0	Optimal	0.41	12	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 96.alb	1	0	Optimal	0.40	10	0.00	0.00
instance n=20 97.alb	1	0	Optimal	0.63	15	0.00	0.00
instance n=20 98.alb	1	0	Optimal	0.42	13	0.00	0.00
instance n=20 99.alb	1	0	Optimal	0.41	12	0.00	0.00
instance n=50 1.alb	1	0	Solution	30.12	8	0.00	0.00
instance n=50 10.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 100.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 101.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 102.alb	1	0	Solution	30.10	34	0.00	0.00
instance n=50 103.alb	1	0	Solution	30.10	30	0.00	0.00
instance n=50 104.alb	1	0	Solution	30.10	29	0.00	0.00
instance n=50 105.alb	1	0	Solution	30.11	27	0.00	0.00
instance n=50 106.alb	1	0	Solution	30.14	29	0.00	0.00
instance n=50 107.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 108.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 109.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 11.alb	1	0	Solution	30.13	7	0.00	0.00
instance n=50 110.alb	1	0	Solution	30.10	28	0.00	0.00
instance n=50 111.alb	1	0	Solution	30.10	29	0.00	0.00
instance n=50 112.alb	1	0	Solution	30.10	29	0.00	0.00
instance n=50 113.alb	1	0	Solution	30.08	31	0.00	0.00
instance n=50 114.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 115.alb	1	0	Solution	30.09	31	0.00	0.00
instance n=50 116.alb	1	0	Solution	30.10	34	0.00	0.00
instance n=50 117.alb	1	0	Solution	30.11	27	0.00	0.00
instance n=50 118.alb	1	0	Solution	30.09	32	0.00	0.00
instance n=50 119.alb	1	0	Solution	30.10	27	0.00	0.00
instance n=50 12.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 120.alb	1	0	Solution	30.11	29	0.00	0.00
instance n=50 121.alb	1	0	Solution	30.11	32	0.00	0.00
instance n=50 122.alb	1	0	Solution	30.09	32	0.00	0.00
instance n=50 123.alb	1	0	Solution	30.11	33	0.00	0.00
instance n=50 124.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 125.alb	1	0	Solution	30.10	34	0.00	0.00
instance n=50 126.alb	1	0	Solution	30.18	12	0.00	0.00
instance n=50 127.alb	1	0	Solution	30.10	14	0.00	0.00
instance n=50 128.alb	1	0	Solution	30.12	13	0.00	0.00
instance n=50 129.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 13.alb	1	0	Solution	30.11	6	0.00	0.00
instance n=50 130.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 131.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 132.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 133.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 134.alb	1	0	Solution	30.11	15	0.00	0.00
instance n=50 135.alb	1	0	Solution	30.10	14	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 136.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 137.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 138.alb	1	0	Solution	30.09	12	0.00	0.00
instance n=50 139.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 14.alb	1	0	Solution	30.13	7	0.00	0.00
instance n=50 140.alb	1	0	Solution	30.09	12	0.00	0.00
instance n=50 141.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 142.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 143.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 144.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 145.alb	1	0	Solution	30.10	10	0.00	0.00
instance n=50 146.alb	1	0	Solution	30.14	13	0.00	0.00
instance n=50 147.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 148.alb	1	0	Solution	30.10	10	0.00	0.00
instance n=50 149.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 15.alb	1	0	Solution	30.12	8	0.00	0.00
instance n=50 150.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 151.alb	1	0	Solution	30.13	7	0.00	0.00
instance n=50 152.alb	1	0	Solution	30.12	7	0.00	0.00
instance n=50 153.alb	1	0	Solution	30.12	8	0.00	0.00
instance n=50 154.alb	1	0	Solution	30.13	8	0.00	0.00
instance n=50 155.alb	1	0	Solution	30.32	7	0.00	0.00
instance n=50 156.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 157.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 158.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 159.alb	1	0	Solution	30.08	7	0.00	0.00
instance n=50 16.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 160.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 161.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 162.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 163.alb	1	0	Solution	30.14	7	0.00	0.00
instance n=50 164.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 165.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 166.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 167.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 168.alb	1	0	Solution	30.11	9	0.00	0.00
instance n=50 169.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 17.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 170.alb	1	0	Solution	30.13	8	0.00	0.00
instance n=50 171.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 172.alb	1	0	Solution	30.07	7	0.00	0.00
instance n=50 173.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 174.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 175.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 176.alb	1	0	Solution	30.12	33	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 177.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 178.alb	1	0	Solution	30.11	32	0.00	0.00
instance n=50 179.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 18.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 180.alb	1	0	Solution	30.11	30	0.00	0.00
instance n=50 181.alb	1	0	Solution	30.12	33	0.00	0.00
instance n=50 182.alb	1	0	Solution	30.11	30	0.00	0.00
instance n=50 183.alb	1	0	Solution	30.11	33	0.00	0.00
instance n=50 184.alb	1	0	Solution	30.11	39	0.00	0.00
instance n=50 185.alb	1	0	Solution	30.12	32	0.00	0.00
instance n=50 186.alb	1	0	Solution	30.11	32	0.00	0.00
instance n=50 187.alb	1	0	Solution	30.11	31	0.00	0.00
instance n=50 188.alb	1	0	Solution	30.11	27	0.00	0.00
instance n=50 189.alb	1	0	Solution	30.11	31	0.00	0.00
instance n=50 19.alb	1	0	Solution	30.13	8	0.00	0.00
instance n=50 190.alb	1	0	Solution	30.10	34	0.00	0.00
instance n=50 191.alb	1	0	Solution	30.11	33	0.00	0.00
instance n=50 192.alb	1	0	Solution	30.11	31	0.00	0.00
instance n=50 193.alb	1	0	Solution	30.10	35	0.00	0.00
instance n=50 194.alb	1	0	Solution	30.09	32	0.00	0.00
instance n=50 195.alb	1	0	Solution	30.09	33	0.00	0.00
instance n=50 196.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 197.alb	1	0	Solution	30.12	32	0.00	0.00
instance n=50 198.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 199.alb	1	0	Solution	30.09	34	0.00	0.00
instance n=50 2.alb	1	0	Solution	30.10	6	0.00	0.00
instance n=50 20.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 200.alb	1	0	Solution	30.10	30	0.00	0.00
instance n=50 201.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 202.alb	1	0	Solution	30.11	10	0.00	0.00
instance n=50 203.alb	1	0	Solution	30.12	12	0.00	0.00
instance n=50 204.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 205.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 206.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 207.alb	1	0	Solution	30.11	10	0.00	0.00
instance n=50 208.alb	1	0	Solution	30.11	14	0.00	0.00
instance n=50 209.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 21.alb	1	0	Solution	30.11	6	0.00	0.00
instance n=50 210.alb	1	0	Solution	30.11	14	0.00	0.00
instance n=50 211.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 212.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 213.alb	1	0	Solution	30.11	14	0.00	0.00
instance n=50 214.alb	1	0	Solution	30.12	11	0.00	0.00
instance n=50 215.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 216.alb	1	0	Solution	30.11	13	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 217.alb	1	0	Solution	30.11	14	0.00	0.00
instance n=50 218.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 219.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 22.alb	1	0	Solution	30.12	7	0.00	0.00
instance n=50 220.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 221.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 222.alb	1	0	Solution	30.11	16	0.00	0.00
instance n=50 223.alb	1	0	Solution	30.09	12	0.00	0.00
instance n=50 224.alb	1	0	Solution	30.13	11	0.00	0.00
instance n=50 225.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 226.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 227.alb	1	0	Optimal	22.91	6	0.00	0.00
instance n=50 228.alb	1	0	Optimal	9.93	6	0.00	0.00
instance n=50 229.alb	1	0	Optimal	9.24	6	0.00	0.00
instance n=50 23.alb	1	0	Solution	30.12	7	0.00	0.00
instance n=50 230.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 231.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 232.alb	1	0	Solution	30.09	8	0.00	0.00
instance n=50 233.alb	1	0	Optimal	4.03	6	0.00	0.00
instance n=50 234.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 235.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 236.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 237.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 238.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 239.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 24.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 240.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 241.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 242.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 243.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 244.alb	1	0	Optimal	14.63	7	0.00	0.00
instance n=50 245.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 246.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 247.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 248.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 249.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 25.alb	1	0	Solution	30.11	6	0.00	0.00
instance n=50 250.alb	1	0	Solution	30.12	7	0.00	0.00
instance n=50 251.alb	1	0	Solution	30.11	29	0.00	0.00
instance n=50 252.alb	1	0	Solution	30.10	35	0.00	0.00
instance n=50 253.alb	1	0	Solution	30.13	31	0.00	0.00
instance n=50 254.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 255.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 256.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 257.alb	1	0	Solution	30.10	35	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 258.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 259.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 26.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 260.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 261.alb	1	0	Solution	30.14	30	0.00	0.00
instance n=50 262.alb	1	0	Solution	30.09	31	0.00	0.00
instance n=50 263.alb	1	0	Solution	30.11	31	0.00	0.00
instance n=50 264.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 265.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 266.alb	1	0	Solution	30.09	31	0.00	0.00
instance n=50 267.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 268.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 269.alb	1	0	Solution	30.10	29	0.00	0.00
instance n=50 27.alb	1	0	Solution	30.10	35	0.00	0.00
instance n=50 270.alb	1	0	Solution	30.10	29	0.00	0.00
instance n=50 271.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 272.alb	1	0	Solution	30.10	30	0.00	0.00
instance n=50 273.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 274.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 275.alb	1	0	Solution	30.09	29	0.00	0.00
instance n=50 276.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 277.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 278.alb	1	0	Solution	30.09	13	0.00	0.00
instance n=50 279.alb	1	0	Solution	30.16	11	0.00	0.00
instance n=50 28.alb	1	0	Solution	30.12	34	0.00	0.00
instance n=50 280.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 281.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 282.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 283.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 284.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 285.alb	1	0	Solution	30.10	14	0.00	0.00
instance n=50 286.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 287.alb	1	0	Solution	30.12	13	0.00	0.00
instance n=50 288.alb	1	0	Solution	30.13	11	0.00	0.00
instance n=50 289.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 29.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 290.alb	1	0	Solution	30.10	14	0.00	0.00
instance n=50 291.alb	1	0	Solution	30.15	12	0.00	0.00
instance n=50 292.alb	1	0	Solution	30.12	13	0.00	0.00
instance n=50 293.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 294.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 295.alb	1	0	Solution	30.10	17	0.00	0.00
instance n=50 296.alb	1	0	Solution	30.12	13	0.00	0.00
instance n=50 297.alb	1	0	Solution	30.12	13	0.00	0.00
instance n=50 298.alb	1	0	Solution	30.13	11	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 299.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 3.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 30.alb	1	0	Solution	30.11	30	0.00	0.00
instance n=50 300.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 301.alb	1	0	Solution	30.12	7	0.00	0.00
instance n=50 302.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 303.alb	1	0	Solution	30.13	8	0.00	0.00
instance n=50 304.alb	1	0	Solution	30.13	7	0.00	0.00
instance n=50 305.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 306.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 307.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 308.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 309.alb	1	0	Solution	30.12	8	0.00	0.00
instance n=50 31.alb	1	0	Solution	30.12	31	0.00	0.00
instance n=50 310.alb	1	0	Solution	30.12	8	0.00	0.00
instance n=50 311.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 312.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 313.alb	1	0	Solution	30.12	8	0.00	0.00
instance n=50 314.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 315.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 316.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 317.alb	1	0	Solution	30.10	6	0.00	0.00
instance n=50 318.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 319.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 32.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 320.alb	1	0	Solution	30.12	8	0.00	0.00
instance n=50 321.alb	1	0	Solution	30.10	6	0.00	0.00
instance n=50 322.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 323.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 324.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 325.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 326.alb	1	0	Solution	30.09	36	0.00	0.00
instance n=50 327.alb	1	0	Solution	30.11	31	0.00	0.00
instance n=50 328.alb	1	0	Solution	30.11	34	0.00	0.00
instance n=50 329.alb	1	0	Solution	30.10	30	0.00	0.00
instance n=50 33.alb	1	0	Solution	30.10	28	0.00	0.00
instance n=50 330.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 331.alb	1	0	Solution	30.10	36	0.00	0.00
instance n=50 332.alb	1	0	Solution	30.12	30	0.00	0.00
instance n=50 333.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 334.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 335.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 336.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 337.alb	1	0	Solution	30.12	31	0.00	0.00
instance n=50 338.alb	1	0	Solution	30.10	34	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 339.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 34.alb	1	0	Solution	30.11	32	0.00	0.00
instance n=50 340.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 341.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 342.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 343.alb	1	0	Solution	30.12	31	0.00	0.00
instance n=50 344.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 345.alb	1	0	Solution	30.12	35	0.00	0.00
instance n=50 346.alb	1	0	Solution	30.11	30	0.00	0.00
instance n=50 347.alb	1	0	Solution	30.13	33	0.00	0.00
instance n=50 348.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 349.alb	1	0	Solution	30.18	33	0.00	0.00
instance n=50 35.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 350.alb	1	0	Solution	30.10	28	0.00	0.00
instance n=50 351.alb	1	0	Solution	30.09	12	0.00	0.00
instance n=50 352.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 353.alb	1	0	Solution	30.11	14	0.00	0.00
instance n=50 354.alb	1	0	Solution	30.11	14	0.00	0.00
instance n=50 355.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 356.alb	1	0	Solution	30.12	16	0.00	0.00
instance n=50 357.alb	1	0	Solution	30.18	13	0.00	0.00
instance n=50 358.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 359.alb	1	0	Solution	30.10	10	0.00	0.00
instance n=50 36.alb	1	0	Solution	30.10	35	0.00	0.00
instance n=50 360.alb	1	0	Solution	30.13	13	0.00	0.00
instance n=50 361.alb	1	0	Solution	30.15	12	0.00	0.00
instance n=50 362.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 363.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 364.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 365.alb	1	0	Solution	30.09	11	0.00	0.00
instance n=50 366.alb	1	0	Solution	30.10	14	0.00	0.00
instance n=50 367.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 368.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 369.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 37.alb	1	0	Solution	30.09	36	0.00	0.00
instance n=50 370.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 371.alb	1	0	Solution	30.13	12	0.00	0.00
instance n=50 372.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 373.alb	1	0	Solution	30.09	13	0.00	0.00
instance n=50 374.alb	1	0	Solution	30.13	11	0.00	0.00
instance n=50 375.alb	1	0	Solution	30.10	14	0.00	0.00
instance n=50 376.alb	1	0	Solution	30.12	7	0.00	0.00
instance n=50 377.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 378.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 379.alb	1	0	Solution	30.11	7	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 38.alb	1	0	Solution	30.10	35	0.00	0.00
instance n=50 380.alb	1	0	Solution	30.12	7	0.00	0.00
instance n=50 381.alb	1	0	Solution	30.13	8	0.00	0.00
instance n=50 382.alb	1	0	Solution	30.08	6	0.00	0.00
instance n=50 383.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 384.alb	1	0	Solution	30.09	9	0.00	0.00
instance n=50 385.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 386.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 387.alb	1	0	Solution	30.17	8	0.00	0.00
instance n=50 388.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 389.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 39.alb	1	0	Solution	30.11	35	0.00	0.00
instance n=50 390.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 391.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 392.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 393.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 394.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 395.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 396.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 397.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 398.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 399.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 4.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 40.alb	1	0	Solution	30.11	32	0.00	0.00
instance n=50 400.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 401.alb	1	0	Solution	30.09	31	0.00	0.00
instance n=50 402.alb	1	0	Solution	30.10	30	0.00	0.00
instance n=50 403.alb	1	0	Solution	30.09	36	0.00	0.00
instance n=50 404.alb	1	0	Solution	30.09	32	0.00	0.00
instance n=50 405.alb	1	0	Solution	30.11	29	0.00	0.00
instance n=50 406.alb	1	0	Solution	30.09	36	0.00	0.00
instance n=50 407.alb	1	0	Solution	30.10	30	0.00	0.00
instance n=50 408.alb	1	0	Solution	30.14	28	0.00	0.00
instance n=50 409.alb	1	0	Solution	30.08	34	0.00	0.00
instance n=50 41.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 410.alb	1	0	Solution	30.08	30	0.00	0.00
instance n=50 411.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 412.alb	1	0	Solution	30.09	29	0.00	0.00
instance n=50 413.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 414.alb	1	0	Solution	30.08	28	0.00	0.00
instance n=50 415.alb	1	0	Solution	30.10	32	0.00	0.00
instance n=50 416.alb	1	0	Solution	30.09	29	0.00	0.00
instance n=50 417.alb	1	0	Solution	30.09	32	0.00	0.00
instance n=50 418.alb	1	0	Solution	30.09	29	0.00	0.00
instance n=50 419.alb	1	0	Solution	30.10	34	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 42.alb	1	0	Solution	30.11	31	0.00	0.00
instance n=50 420.alb	1	0	Solution	30.13	30	0.00	0.00
instance n=50 421.alb	1	0	Solution	30.09	35	0.00	0.00
instance n=50 422.alb	1	0	Solution	30.09	31	0.00	0.00
instance n=50 423.alb	1	0	Solution	30.09	31	0.00	0.00
instance n=50 424.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 425.alb	1	0	Solution	30.10	35	0.00	0.00
instance n=50 426.alb	1	0	Solution	30.19	12	0.00	0.00
instance n=50 427.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 428.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 429.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 43.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 430.alb	1	0	Solution	30.10	15	0.00	0.00
instance n=50 431.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 432.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 433.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 434.alb	1	0	Solution	30.14	11	0.00	0.00
instance n=50 435.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 436.alb	1	0	Solution	30.09	11	0.00	0.00
instance n=50 437.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 438.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 439.alb	1	0	Solution	30.13	13	0.00	0.00
instance n=50 44.alb	1	0	Solution	30.11	31	0.00	0.00
instance n=50 440.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 441.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 442.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 443.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 444.alb	1	0	Solution	30.11	12	0.00	0.00
instance n=50 445.alb	1	0	Solution	30.13	12	0.00	0.00
instance n=50 446.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 447.alb	1	0	Solution	30.10	14	0.00	0.00
instance n=50 448.alb	1	0	Solution	30.10	13	0.00	0.00
instance n=50 449.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 45.alb	1	0	Solution	30.11	28	0.00	0.00
instance n=50 450.alb	1	0	Solution	30.13	11	0.00	0.00
instance n=50 451.alb	1	0	Optimal	3.72	8	0.00	0.00
instance n=50 452.alb	1	0	Optimal	2.81	8	0.00	0.00
instance n=50 453.alb	1	0	Optimal	2.55	7	0.00	0.00
instance n=50 454.alb	1	0	Optimal	3.73	8	0.00	0.00
instance n=50 455.alb	1	0	Optimal	2.59	6	0.00	0.00
instance n=50 456.alb	1	0	Optimal	2.85	8	0.00	0.00
instance n=50 457.alb	1	0	Optimal	2.71	8	0.00	0.00
instance n=50 458.alb	1	0	Optimal	2.65	7	0.00	0.00
instance n=50 459.alb	1	0	Optimal	2.54	7	0.00	0.00
instance n=50 46.alb	1	0	Solution	30.09	33	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 460.alb	1	0	Optimal	3.10	7	0.00	0.00
instance n=50 461.alb	1	0	Optimal	2.66	6	0.00	0.00
instance n=50 462.alb	1	0	Optimal	3.26	7	0.00	0.00
instance n=50 463.alb	1	0	Optimal	2.83	8	0.00	0.00
instance n=50 464.alb	1	0	Optimal	2.73	6	0.00	0.00
instance n=50 465.alb	1	0	Optimal	2.67	8	0.00	0.00
instance n=50 466.alb	1	0	Optimal	2.78	7	0.00	0.00
instance n=50 467.alb	1	0	Optimal	5.73	9	0.00	0.00
instance n=50 468.alb	1	0	Optimal	2.68	7	0.00	0.00
instance n=50 469.alb	1	0	Optimal	2.67	8	0.00	0.00
instance n=50 47.alb	1	0	Solution	30.10	33	0.00	0.00
instance n=50 470.alb	1	0	Optimal	3.42	8	0.00	0.00
instance n=50 471.alb	1	0	Optimal	2.64	7	0.00	0.00
instance n=50 472.alb	1	0	Optimal	2.81	8	0.00	0.00
instance n=50 473.alb	1	0	Optimal	2.52	7	0.00	0.00
instance n=50 474.alb	1	0	Optimal	2.86	7	0.00	0.00
instance n=50 475.alb	1	0	Optimal	2.49	6	0.00	0.00
instance n=50 476.alb	1	0	Optimal	9.05	28	0.00	0.00
instance n=50 477.alb	1	0	Solution	30.09	29	0.00	0.00
instance n=50 478.alb	1	0	Solution	30.09	32	0.00	0.00
instance n=50 479.alb	1	0	Optimal	19.68	28	0.00	0.00
instance n=50 48.alb	1	0	Solution	30.11	32	0.00	0.00
instance n=50 480.alb	1	0	Optimal	7.19	34	0.00	0.00
instance n=50 481.alb	1	0	Solution	30.09	28	0.00	0.00
instance n=50 482.alb	1	0	Optimal	5.35	27	0.00	0.00
instance n=50 483.alb	1	0	Solution	30.08	30	0.00	0.00
instance n=50 484.alb	1	0	Optimal	15.58	32	0.00	0.00
instance n=50 485.alb	1	0	Solution	30.09	31	0.00	0.00
instance n=50 486.alb	1	0	Optimal	5.60	32	0.00	0.00
instance n=50 487.alb	1	0	Solution	30.09	31	0.00	0.00
instance n=50 488.alb	1	0	Solution	30.07	31	0.00	0.00
instance n=50 489.alb	1	0	Solution	30.09	35	0.00	0.00
instance n=50 49.alb	1	0	Solution	30.10	31	0.00	0.00
instance n=50 490.alb	1	0	Solution	30.08	29	0.00	0.00
instance n=50 491.alb	1	0	Solution	30.09	35	0.00	0.00
instance n=50 492.alb	1	0	Solution	30.08	29	0.00	0.00
instance n=50 493.alb	1	0	Solution	30.08	30	0.00	0.00
instance n=50 494.alb	1	0	Solution	30.08	32	0.00	0.00
instance n=50 495.alb	1	0	Solution	30.08	34	0.00	0.00
instance n=50 496.alb	1	0	Solution	30.08	29	0.00	0.00
instance n=50 497.alb	1	0	Solution	30.10	30	0.00	0.00
instance n=50 498.alb	1	0	Solution	30.09	30	0.00	0.00
instance n=50 499.alb	1	0	Solution	30.09	33	0.00	0.00
instance n=50 5.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 50.alb	1	0	Solution	30.11	32	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 500.alb	1	0	Solution	30.09	34	0.00	0.00
instance n=50 501.alb	1	0	Optimal	3.41	12	0.00	0.00
instance n=50 502.alb	1	0	Optimal	2.80	10	0.00	0.00
instance n=50 503.alb	1	0	Optimal	4.21	13	0.00	0.00
instance n=50 504.alb	1	0	Optimal	4.68	11	0.00	0.00
instance n=50 505.alb	1	0	Optimal	2.81	12	0.00	0.00
instance n=50 506.alb	1	0	Optimal	4.35	11	0.00	0.00
instance n=50 507.alb	1	0	Optimal	3.36	13	0.00	0.00
instance n=50 508.alb	1	0	Optimal	2.87	14	0.00	0.00
instance n=50 509.alb	1	0	Optimal	3.42	13	0.00	0.00
instance n=50 51.alb	1	0	Solution	30.10	12	0.00	0.00
instance n=50 510.alb	1	0	Optimal	5.55	11	0.00	0.00
instance n=50 511.alb	1	0	Optimal	2.96	13	0.00	0.00
instance n=50 512.alb	1	0	Optimal	7.95	13	0.00	0.00
instance n=50 513.alb	1	0	Optimal	3.73	12	0.00	0.00
instance n=50 514.alb	1	0	Optimal	3.78	12	0.00	0.00
instance n=50 515.alb	1	0	Optimal	5.82	11	0.00	0.00
instance n=50 516.alb	1	0	Optimal	3.69	13	0.00	0.00
instance n=50 517.alb	1	0	Optimal	6.75	14	0.00	0.00
instance n=50 518.alb	1	0	Optimal	3.19	11	0.00	0.00
instance n=50 519.alb	1	0	Optimal	4.24	12	0.00	0.00
instance n=50 52.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 520.alb	1	0	Optimal	3.62	11	0.00	0.00
instance n=50 521.alb	1	0	Optimal	3.39	10	0.00	0.00
instance n=50 522.alb	1	0	Optimal	2.92	11	0.00	0.00
instance n=50 523.alb	1	0	Optimal	3.05	11	0.00	0.00
instance n=50 524.alb	1	0	Optimal	4.63	14	0.00	0.00
instance n=50 525.alb	1	0	Optimal	4.64	11	0.00	0.00
instance n=50 53.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 54.alb	1	0	Solution	30.09	12	0.00	0.00
instance n=50 55.alb	1	0	Solution	30.13	14	0.00	0.00
instance n=50 56.alb	1	0	Solution	30.12	12	0.00	0.00
instance n=50 57.alb	1	0	Solution	30.12	15	0.00	0.00
instance n=50 58.alb	1	0	Solution	30.10	11	0.00	0.00
instance n=50 59.alb	1	0	Solution	30.11	11	0.00	0.00
instance n=50 6.alb	1	0	Solution	30.11	6	0.00	0.00
instance n=50 60.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 61.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 62.alb	1	0	Solution	30.11	14	0.00	0.00
instance n=50 63.alb	1	0	Solution	30.12	12	0.00	0.00
instance n=50 64.alb	1	0	Solution	30.12	13	0.00	0.00
instance n=50 65.alb	1	0	Solution	30.12	12	0.00	0.00
instance n=50 66.alb	1	0	Solution	30.12	14	0.00	0.00
instance n=50 67.alb	1	0	Solution	30.12	13	0.00	0.00
instance n=50 68.alb	1	0	Solution	30.12	12	0.00	0.00

Table 6.3: Results for SALBP-1 Problems (Cplex) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 69.alb	1	0	Solution	30.11	13	0.00	0.00
instance n=50 7.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 70.alb	1	0	Solution	30.11	10	0.00	0.00
instance n=50 71.alb	1	0	Solution	30.11	15	0.00	0.00
instance n=50 72.alb	1	0	Solution	30.12	11	0.00	0.00
instance n=50 73.alb	1	0	Solution	30.12	12	0.00	0.00
instance n=50 74.alb	1	0	Solution	30.12	12	0.00	0.00
instance n=50 75.alb	1	0	Solution	30.13	12	0.00	0.00
instance n=50 76.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 77.alb	1	0	Solution	30.08	7	0.00	0.00
instance n=50 78.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 79.alb	1	0	Solution	30.12	8	0.00	0.00
instance n=50 8.alb	1	0	Solution	30.12	7	0.00	0.00
instance n=50 80.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 81.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 82.alb	1	0	Solution	30.11	6	0.00	0.00
instance n=50 83.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 84.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 85.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 86.alb	1	0	Solution	30.15	7	0.00	0.00
instance n=50 87.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 88.alb	1	0	Solution	30.10	8	0.00	0.00
instance n=50 89.alb	1	0	Solution	30.09	7	0.00	0.00
instance n=50 9.alb	1	0	Solution	30.12	9	0.00	0.00
instance n=50 90.alb	1	0	Solution	30.11	8	0.00	0.00
instance n=50 91.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 92.alb	1	0	Solution	30.14	7	0.00	0.00
instance n=50 93.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 94.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 95.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 96.alb	1	0	Solution	30.11	7	0.00	0.00
instance n=50 97.alb	1	0	Solution	30.10	7	0.00	0.00
instance n=50 98.alb	1	0	Solution	30.16	8	0.00	0.00
instance n=50 99.alb	1	0	Solution	30.10	7	0.00	0.00

6.4 Results for MiniZinc/Chuffed

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 1.alb	1	0	Solution	120.13	78	0.00	0.00
instance n=100 10.alb	1	0	Solution	120.13	56	0.00	0.00
instance n=100 100.alb	1	0	Solution	120.14	65	0.00	0.00
instance n=100 101.alb	1	0	Solution	120.13	70	0.00	0.00
instance n=100 102.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 103.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 104.alb	1	0	Solution	120.13	83	0.00	0.00
instance n=100 105.alb	1	0	Solution	120.11	13	0.00	0.00
instance n=100 106.alb	1	0	Solution	120.12	14	0.00	0.00
instance n=100 107.alb	1	0	Solution	120.12	14	0.00	0.00
instance n=100 108.alb	1	0	Solution	120.14	15	0.00	0.00
instance n=100 109.alb	1	0	Solution	120.12	92	0.00	0.00
instance n=100 11.alb	1	0	Solution	120.13	88	0.00	0.00
instance n=100 110.alb	1	0	Solution	120.13	84	0.00	0.00
instance n=100 111.alb	1	0	Solution	120.13	98	0.00	0.00
instance n=100 112.alb	1	0	Solution	120.14	14	0.00	0.00
instance n=100 113.alb	1	0	Solution	120.14	49	0.00	0.00
instance n=100 114.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 115.alb	1	0	Solution	120.13	17	0.00	0.00
instance n=100 116.alb	1	0	Solution	120.14	71	0.00	0.00
instance n=100 117.alb	1	0	Solution	120.12	78	0.00	0.00
instance n=100 118.alb	1	0	Solution	120.12	15	0.00	0.00
instance n=100 119.alb	1	0	Solution	120.13	90	0.00	0.00
instance n=100 12.alb	1	0	Solution	120.13	79	0.00	0.00
instance n=100 120.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 121.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 122.alb	1	0	Solution	120.12	19	0.00	0.00
instance n=100 123.alb	1	0	Solution	120.12	71	0.00	0.00
instance n=100 124.alb	1	0	Solution	120.13	16	0.00	0.00
instance n=100 125.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 126.alb	1	0	Solution	120.14	63	0.00	0.00
instance n=100 127.alb	1	0	Solution	120.14	53	0.00	0.00
instance n=100 128.alb	1	0	Solution	120.12	83	0.00	0.00
instance n=100 129.alb	1	0	Solution	120.13	55	0.00	0.00
instance n=100 13.alb	1	0	Solution	120.13	84	0.00	0.00
instance n=100 130.alb	1	0	Solution	120.13	56	0.00	0.00
instance n=100 131.alb	1	0	Solution	120.13	71	0.00	0.00
instance n=100 132.alb	1	0	Solution	120.13	77	0.00	0.00
instance n=100 133.alb	1	0	Solution	120.12	56	0.00	0.00
instance n=100 134.alb	1	0	Solution	120.12	56	0.00	0.00
instance n=100 135.alb	1	0	Solution	120.12	57	0.00	0.00
instance n=100 136.alb	1	0	Solution	120.13	76	0.00	0.00
instance n=100 137.alb	1	0	Solution	120.13	66	0.00	0.00
instance n=100 138.alb	1	0	Solution	120.13	76	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 139.alb	1	0	Solution	120.12	84	0.00	0.00
instance n=100 14.alb	1	0	Solution	120.12	66	0.00	0.00
instance n=100 140.alb	1	0	Solution	120.13	69	0.00	0.00
instance n=100 141.alb	1	0	Solution	120.13	53	0.00	0.00
instance n=100 142.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 143.alb	1	0	Solution	120.11	64	0.00	0.00
instance n=100 144.alb	1	0	Solution	120.12	76	0.00	0.00
instance n=100 145.alb	1	0	Solution	120.11	82	0.00	0.00
instance n=100 146.alb	1	0	Solution	120.12	53	0.00	0.00
instance n=100 147.alb	1	0	Solution	120.12	71	0.00	0.00
instance n=100 148.alb	1	0	Solution	120.13	80	0.00	0.00
instance n=100 149.alb	1	0	Solution	120.13	76	0.00	0.00
instance n=100 15.alb	1	0	Solution	120.13	63	0.00	0.00
instance n=100 150.alb	1	0	Solution	120.12	59	0.00	0.00
instance n=100 151.alb	1	0	Solution	120.13	36	0.00	0.00
instance n=100 152.alb	1	0	Solution	120.13	75	0.00	0.00
instance n=100 153.alb	1	0	Solution	120.13	21	0.00	0.00
instance n=100 154.alb	1	0	Solution	120.12	76	0.00	0.00
instance n=100 155.alb	1	0	Solution	120.13	98	0.00	0.00
instance n=100 156.alb	1	0	Solution	120.12	69	0.00	0.00
instance n=100 157.alb	1	0	Solution	120.13	42	0.00	0.00
instance n=100 158.alb	1	0	Solution	120.13	86	0.00	0.00
instance n=100 159.alb	1	0	Solution	120.12	78	0.00	0.00
instance n=100 16.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 160.alb	1	0	Solution	120.11	89	0.00	0.00
instance n=100 161.alb	1	0	Solution	120.12	56	0.00	0.00
instance n=100 162.alb	1	0	Solution	120.14	32	0.00	0.00
instance n=100 163.alb	1	0	Solution	120.13	76	0.00	0.00
instance n=100 164.alb	1	0	Solution	120.12	53	0.00	0.00
instance n=100 165.alb	1	0	Solution	120.13	70	0.00	0.00
instance n=100 166.alb	1	0	Solution	120.13	32	0.00	0.00
instance n=100 167.alb	1	0	Solution	120.12	51	0.00	0.00
instance n=100 168.alb	1	0	Solution	120.11	75	0.00	0.00
instance n=100 169.alb	1	0	Solution	120.14	94	0.00	0.00
instance n=100 17.alb	1	0	Solution	120.13	68	0.00	0.00
instance n=100 170.alb	1	0	Solution	120.13	38	0.00	0.00
instance n=100 171.alb	1	0	Solution	120.13	25	0.00	0.00
instance n=100 172.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 173.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 174.alb	1	0	Solution	120.12	47	0.00	0.00
instance n=100 175.alb	1	0	Solution	120.13	71	0.00	0.00
instance n=100 176.alb	1	0	Solution	120.13	80	0.00	0.00
instance n=100 177.alb	1	0	Solution	120.12	95	0.00	0.00
instance n=100 178.alb	1	0	Solution	120.12	81	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 179.alb	1	0	Solution	120.11	74	0.00	0.00
instance n=100 18.alb	1	0	Solution	120.13	95	0.00	0.00
instance n=100 180.alb	1	0	Solution	120.13	91	0.00	0.00
instance n=100 181.alb	1	0	Solution	120.13	60	0.00	0.00
instance n=100 182.alb	1	0	Solution	120.12	47	0.00	0.00
instance n=100 183.alb	1	0	Solution	120.13	72	0.00	0.00
instance n=100 184.alb	1	0	Solution	120.11	96	0.00	0.00
instance n=100 185.alb	1	0	Solution	120.13	54	0.00	0.00
instance n=100 186.alb	1	0	Solution	120.14	64	0.00	0.00
instance n=100 187.alb	1	0	Solution	120.12	48	0.00	0.00
instance n=100 188.alb	1	0	Solution	120.13	69	0.00	0.00
instance n=100 189.alb	1	0	Solution	120.13	85	0.00	0.00
instance n=100 19.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 190.alb	1	0	Solution	120.13	89	0.00	0.00
instance n=100 191.alb	1	0	Solution	120.13	78	0.00	0.00
instance n=100 192.alb	1	0	Solution	120.13	78	0.00	0.00
instance n=100 193.alb	1	0	Solution	120.13	98	0.00	0.00
instance n=100 194.alb	1	0	Solution	120.12	80	0.00	0.00
instance n=100 195.alb	1	0	Solution	120.12	85	0.00	0.00
instance n=100 196.alb	1	0	Solution	120.12	97	0.00	0.00
instance n=100 197.alb	1	0	Solution	120.16	24	0.00	0.00
instance n=100 198.alb	1	0	Solution	120.13	79	0.00	0.00
instance n=100 199.alb	1	0	Solution	120.14	19	0.00	0.00
instance n=100 2.alb	1	0	Solution	120.12	51	0.00	0.00
instance n=100 20.alb	1	0	Solution	120.12	76	0.00	0.00
instance n=100 200.alb	1	0	Solution	120.11	96	0.00	0.00
instance n=100 201.alb	1	0	Solution	120.12	84	0.00	0.00
instance n=100 202.alb	1	0	Solution	120.12	92	0.00	0.00
instance n=100 203.alb	1	0	Solution	120.13	64	0.00	0.00
instance n=100 204.alb	1	0	Solution	120.14	80	0.00	0.00
instance n=100 205.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 206.alb	1	0	Solution	120.11	57	0.00	0.00
instance n=100 207.alb	1	0	Solution	120.13	70	0.00	0.00
instance n=100 208.alb	1	0	Solution	120.13	87	0.00	0.00
instance n=100 209.alb	1	0	Solution	120.13	78	0.00	0.00
instance n=100 21.alb	1	0	Solution	120.12	79	0.00	0.00
instance n=100 210.alb	1	0	Solution	120.12	65	0.00	0.00
instance n=100 211.alb	1	0	Solution	120.11	81	0.00	0.00
instance n=100 212.alb	1	0	Solution	120.13	55	0.00	0.00
instance n=100 213.alb	1	0	Solution	120.13	96	0.00	0.00
instance n=100 214.alb	1	0	Solution	120.13	87	0.00	0.00
instance n=100 215.alb	1	0	Solution	120.12	76	0.00	0.00
instance n=100 216.alb	1	0	Solution	120.13	94	0.00	0.00
instance n=100 217.alb	1	0	Solution	120.12	84	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 218.alb	1	0	Solution	120.13	57	0.00	0.00
instance n=100 219.alb	1	0	Solution	120.13	88	0.00	0.00
instance n=100 22.alb	1	0	Solution	120.12	48	0.00	0.00
instance n=100 220.alb	1	0	Solution	120.14	87	0.00	0.00
instance n=100 221.alb	1	0	Solution	120.13	88	0.00	0.00
instance n=100 222.alb	1	0	Solution	120.12	66	0.00	0.00
instance n=100 223.alb	1	0	Solution	120.12	64	0.00	0.00
instance n=100 224.alb	1	0	Solution	120.13	63	0.00	0.00
instance n=100 225.alb	1	0	Solution	120.13	58	0.00	0.00
instance n=100 226.alb	1	0	Solution	120.14	68	0.00	0.00
instance n=100 227.alb	1	0	Solution	120.13	27	0.00	0.00
instance n=100 228.alb	1	0	Solution	120.12	22	0.00	0.00
instance n=100 229.alb	1	0	Solution	120.13	24	0.00	0.00
instance n=100 23.alb	1	0	Solution	120.13	98	0.00	0.00
instance n=100 230.alb	1	0	Solution	120.14	38	0.00	0.00
instance n=100 231.alb	1	0	Solution	120.13	23	0.00	0.00
instance n=100 232.alb	1	0	Solution	120.13	35	0.00	0.00
instance n=100 233.alb	1	0	Solution	120.12	36	0.00	0.00
instance n=100 234.alb	1	0	Solution	120.12	23	0.00	0.00
instance n=100 235.alb	1	0	Solution	120.13	26	0.00	0.00
instance n=100 236.alb	1	0	Solution	120.13	23	0.00	0.00
instance n=100 237.alb	1	0	Solution	120.12	23	0.00	0.00
instance n=100 238.alb	1	0	Solution	120.13	49	0.00	0.00
instance n=100 239.alb	1	0	Solution	120.13	92	0.00	0.00
instance n=100 24.alb	1	0	Solution	120.12	69	0.00	0.00
instance n=100 240.alb	1	0	Solution	120.13	22	0.00	0.00
instance n=100 241.alb	1	0	Solution	120.13	67	0.00	0.00
instance n=100 242.alb	1	0	Solution	120.13	87	0.00	0.00
instance n=100 243.alb	1	0	Solution	120.13	28	0.00	0.00
instance n=100 244.alb	1	0	Solution	120.13	51	0.00	0.00
instance n=100 245.alb	1	0	Solution	120.12	24	0.00	0.00
instance n=100 246.alb	1	0	Solution	120.12	26	0.00	0.00
instance n=100 247.alb	1	0	Solution	120.14	24	0.00	0.00
instance n=100 248.alb	1	0	Solution	120.13	20	0.00	0.00
instance n=100 249.alb	1	0	Solution	120.13	69	0.00	0.00
instance n=100 25.alb	1	0	Solution	120.12	95	0.00	0.00
instance n=100 250.alb	1	0	Solution	120.12	24	0.00	0.00
instance n=100 251.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 252.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 253.alb	1	0	Solution	120.12	93	0.00	0.00
instance n=100 254.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 255.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 256.alb	1	0	Solution	120.12	15	0.00	0.00
instance n=100 257.alb	1	0	Solution	120.13	13	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 258.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 259.alb	1	0	Solution	120.14	35	0.00	0.00
instance n=100 26.alb	1	0	Solution	120.13	81	0.00	0.00
instance n=100 260.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 261.alb	1	0	Solution	120.12	49	0.00	0.00
instance n=100 262.alb	1	0	Solution	120.14	14	0.00	0.00
instance n=100 263.alb	1	0	Solution	120.12	14	0.00	0.00
instance n=100 264.alb	1	0	Solution	120.12	69	0.00	0.00
instance n=100 265.alb	1	0	Solution	120.13	96	0.00	0.00
instance n=100 266.alb	1	0	Solution	120.13	13	0.00	0.00
instance n=100 267.alb	1	0	Solution	120.12	13	0.00	0.00
instance n=100 268.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 269.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 27.alb	1	0	Solution	120.13	56	0.00	0.00
instance n=100 270.alb	1	0	Solution	120.13	13	0.00	0.00
instance n=100 271.alb	1	0	Solution	120.13	95	0.00	0.00
instance n=100 272.alb	1	0	Solution	120.12	14	0.00	0.00
instance n=100 273.alb	1	0	Solution	120.13	13	0.00	0.00
instance n=100 274.alb	1	0	Solution	120.14	14	0.00	0.00
instance n=100 275.alb	1	0	Solution	120.14	13	0.00	0.00
instance n=100 276.alb	1	0	Solution	120.12	63	0.00	0.00
instance n=100 277.alb	1	0	Solution	120.13	78	0.00	0.00
instance n=100 278.alb	1	0	Solution	120.12	61	0.00	0.00
instance n=100 279.alb	1	0	Solution	120.12	58	0.00	0.00
instance n=100 28.alb	1	0	Solution	120.14	74	0.00	0.00
instance n=100 280.alb	1	0	Solution	120.13	68	0.00	0.00
instance n=100 281.alb	1	0	Solution	120.13	83	0.00	0.00
instance n=100 282.alb	1	0	Solution	120.12	90	0.00	0.00
instance n=100 283.alb	1	0	Solution	120.12	56	0.00	0.00
instance n=100 284.alb	1	0	Solution	120.13	59	0.00	0.00
instance n=100 285.alb	1	0	Solution	120.14	57	0.00	0.00
instance n=100 286.alb	1	0	Solution	120.13	84	0.00	0.00
instance n=100 287.alb	1	0	Solution	120.14	55	0.00	0.00
instance n=100 288.alb	1	0	Solution	120.13	58	0.00	0.00
instance n=100 289.alb	1	0	Solution	120.11	64	0.00	0.00
instance n=100 29.alb	1	0	Solution	120.12	83	0.00	0.00
instance n=100 290.alb	1	0	Solution	120.13	60	0.00	0.00
instance n=100 291.alb	1	0	Solution	120.13	54	0.00	0.00
instance n=100 292.alb	1	0	Solution	120.13	60	0.00	0.00
instance n=100 293.alb	1	0	Solution	120.13	84	0.00	0.00
instance n=100 294.alb	1	0	Solution	120.12	57	0.00	0.00
instance n=100 295.alb	1	0	Solution	120.12	62	0.00	0.00
instance n=100 296.alb	1	0	Solution	120.13	57	0.00	0.00
instance n=100 297.alb	1	0	Solution	120.12	79	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 298.alb	1	0	Solution	120.13	61	0.00	0.00
instance n=100 299.alb	1	0	Solution	120.12	69	0.00	0.00
instance n=100 3.alb	1	0	Solution	120.11	55	0.00	0.00
instance n=100 30.alb	1	0	Solution	120.13	73	0.00	0.00
instance n=100 300.alb	1	0	Solution	120.12	55	0.00	0.00
instance n=100 301.alb	1	0	Solution	120.13	31	0.00	0.00
instance n=100 302.alb	1	0	Solution	120.13	35	0.00	0.00
instance n=100 303.alb	1	0	Solution	120.11	65	0.00	0.00
instance n=100 304.alb	1	0	Solution	120.11	81	0.00	0.00
instance n=100 305.alb	1	0	Solution	120.12	82	0.00	0.00
instance n=100 306.alb	1	0	Solution	120.13	81	0.00	0.00
instance n=100 307.alb	1	0	Solution	120.12	44	0.00	0.00
instance n=100 308.alb	1	0	Solution	120.12	75	0.00	0.00
instance n=100 309.alb	1	0	Solution	120.13	80	0.00	0.00
instance n=100 31.alb	1	0	Solution	120.11	38	0.00	0.00
instance n=100 310.alb	1	0	Solution	120.11	57	0.00	0.00
instance n=100 311.alb	1	0	Solution	120.13	94	0.00	0.00
instance n=100 312.alb	1	0	Solution	120.13	68	0.00	0.00
instance n=100 313.alb	1	0	Solution	120.13	88	0.00	0.00
instance n=100 314.alb	1	0	Solution	120.14	43	0.00	0.00
instance n=100 315.alb	1	0	Solution	120.12	51	0.00	0.00
instance n=100 316.alb	1	0	Solution	120.12	82	0.00	0.00
instance n=100 317.alb	1	0	Solution	120.13	97	0.00	0.00
instance n=100 318.alb	1	0	Solution	120.13	95	0.00	0.00
instance n=100 319.alb	1	0	Solution	120.12	85	0.00	0.00
instance n=100 32.alb	1	0	Solution	120.12	82	0.00	0.00
instance n=100 320.alb	1	0	Solution	120.12	95	0.00	0.00
instance n=100 321.alb	1	0	Solution	120.11	70	0.00	0.00
instance n=100 322.alb	1	0	Solution	120.12	59	0.00	0.00
instance n=100 323.alb	1	0	Solution	120.12	70	0.00	0.00
instance n=100 324.alb	1	0	Solution	120.12	66	0.00	0.00
instance n=100 325.alb	1	0	Solution	120.12	58	0.00	0.00
instance n=100 326.alb	1	0	Solution	120.13	92	0.00	0.00
instance n=100 327.alb	1	0	Solution	120.12	85	0.00	0.00
instance n=100 328.alb	1	0	Solution	120.12	82	0.00	0.00
instance n=100 329.alb	1	0	Solution	120.13	83	0.00	0.00
instance n=100 33.alb	1	0	Solution	120.12	50	0.00	0.00
instance n=100 330.alb	1	0	Solution	120.12	66	0.00	0.00
instance n=100 331.alb	1	0	Solution	120.13	86	0.00	0.00
instance n=100 332.alb	1	0	Solution	120.13	81	0.00	0.00
instance n=100 333.alb	1	0	Solution	120.16	86	0.00	0.00
instance n=100 334.alb	1	0	Solution	120.13	70	0.00	0.00
instance n=100 335.alb	1	0	Solution	120.13	71	0.00	0.00
instance n=100 336.alb	1	0	Solution	120.12	61	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 337.alb	1	0	Solution	120.12	85	0.00	0.00
instance n=100 338.alb	1	0	Solution	120.13	60	0.00	0.00
instance n=100 339.alb	1	0	Solution	120.11	88	0.00	0.00
instance n=100 34.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 340.alb	1	0	Solution	120.13	72	0.00	0.00
instance n=100 341.alb	1	0	Solution	120.14	75	0.00	0.00
instance n=100 342.alb	1	0	Solution	120.12	71	0.00	0.00
instance n=100 343.alb	1	0	Solution	120.13	81	0.00	0.00
instance n=100 344.alb	1	0	Solution	120.11	96	0.00	0.00
instance n=100 345.alb	1	0	Solution	120.12	14	0.00	0.00
instance n=100 346.alb	1	0	Solution	120.13	95	0.00	0.00
instance n=100 347.alb	1	0	Solution	120.13	73	0.00	0.00
instance n=100 348.alb	1	0	Solution	120.12	99	0.00	0.00
instance n=100 349.alb	1	0	Solution	120.10	79	0.00	0.00
instance n=100 35.alb	1	0	Solution	120.12	89	0.00	0.00
instance n=100 350.alb	1	0	Solution	120.11	78	0.00	0.00
instance n=100 351.alb	1	0	Solution	120.13	89	0.00	0.00
instance n=100 352.alb	1	0	Solution	120.13	92	0.00	0.00
instance n=100 353.alb	1	0	Solution	120.13	83	0.00	0.00
instance n=100 354.alb	1	0	Solution	120.13	76	0.00	0.00
instance n=100 355.alb	1	0	Solution	120.13	88	0.00	0.00
instance n=100 356.alb	1	0	Solution	120.12	97	0.00	0.00
instance n=100 357.alb	1	0	Solution	120.13	98	0.00	0.00
instance n=100 358.alb	1	0	Solution	120.11	87	0.00	0.00
instance n=100 359.alb	1	0	Solution	120.12	94	0.00	0.00
instance n=100 36.alb	1	0	Solution	120.13	70	0.00	0.00
instance n=100 360.alb	1	0	Solution	120.13	81	0.00	0.00
instance n=100 361.alb	1	0	Solution	120.12	66	0.00	0.00
instance n=100 362.alb	1	0	Solution	120.13	75	0.00	0.00
instance n=100 363.alb	1	0	Solution	120.13	92	0.00	0.00
instance n=100 364.alb	1	0	Solution	120.13	86	0.00	0.00
instance n=100 365.alb	1	0	Solution	120.13	86	0.00	0.00
instance n=100 366.alb	1	0	Solution	120.13	95	0.00	0.00
instance n=100 367.alb	1	0	Solution	120.12	87	0.00	0.00
instance n=100 368.alb	1	0	Solution	120.15	99	0.00	0.00
instance n=100 369.alb	1	0	Solution	120.14	61	0.00	0.00
instance n=100 37.alb	1	0	Solution	120.13	95	0.00	0.00
instance n=100 370.alb	1	0	Solution	120.13	90	0.00	0.00
instance n=100 371.alb	1	0	Solution	120.13	81	0.00	0.00
instance n=100 372.alb	1	0	Solution	120.12	83	0.00	0.00
instance n=100 373.alb	1	0	Solution	120.13	67	0.00	0.00
instance n=100 374.alb	1	0	Solution	120.13	99	0.00	0.00
instance n=100 375.alb	1	0	Solution	120.13	92	0.00	0.00
instance n=100 376.alb	1	0	Solution	120.12	32	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 377.alb	1	0	Solution	120.13	28	0.00	0.00
instance n=100 378.alb	1	0	Solution	120.15	86	0.00	0.00
instance n=100 379.alb	1	0	Solution	120.11	90	0.00	0.00
instance n=100 38.alb	1	0	Solution	120.12	80	0.00	0.00
instance n=100 380.alb	1	0	Solution	120.13	46	0.00	0.00
instance n=100 381.alb	1	0	Solution	120.12	98	0.00	0.00
instance n=100 382.alb	1	0	Solution	120.16	43	0.00	0.00
instance n=100 383.alb	1	0	Solution	120.13	67	0.00	0.00
instance n=100 384.alb	1	0	Solution	120.12	96	0.00	0.00
instance n=100 385.alb	1	0	Solution	120.13	22	0.00	0.00
instance n=100 386.alb	1	0	Solution	120.14	72	0.00	0.00
instance n=100 387.alb	1	0	Solution	120.13	65	0.00	0.00
instance n=100 388.alb	1	0	Solution	120.13	40	0.00	0.00
instance n=100 389.alb	1	0	Solution	120.15	45	0.00	0.00
instance n=100 39.alb	1	0	Solution	120.11	94	0.00	0.00
instance n=100 390.alb	1	0	Solution	120.13	63	0.00	0.00
instance n=100 391.alb	1	0	Solution	120.12	86	0.00	0.00
instance n=100 392.alb	1	0	Solution	120.13	77	0.00	0.00
instance n=100 393.alb	1	0	Solution	120.12	24	0.00	0.00
instance n=100 394.alb	1	0	Solution	120.14	22	0.00	0.00
instance n=100 395.alb	1	0	Solution	120.11	82	0.00	0.00
instance n=100 396.alb	1	0	Solution	120.13	61	0.00	0.00
instance n=100 397.alb	1	0	Solution	120.12	27	0.00	0.00
instance n=100 398.alb	1	0	Solution	120.13	78	0.00	0.00
instance n=100 399.alb	1	0	Solution	120.13	43	0.00	0.00
instance n=100 4.alb	1	0	Solution	120.13	57	0.00	0.00
instance n=100 40.alb	1	0	Solution	120.12	73	0.00	0.00
instance n=100 400.alb	1	0	Solution	120.13	24	0.00	0.00
instance n=100 401.alb	1	0	Solution	120.13	70	0.00	0.00
instance n=100 402.alb	1	0	Solution	120.13	87	0.00	0.00
instance n=100 403.alb	1	0	Solution	120.12	53	0.00	0.00
instance n=100 404.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 405.alb	1	0	Solution	120.12	87	0.00	0.00
instance n=100 406.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 407.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 408.alb	1	0	Solution	120.13	94	0.00	0.00
instance n=100 409.alb	1	0	Solution	120.13	26	0.00	0.00
instance n=100 41.alb	1	0	Solution	120.12	49	0.00	0.00
instance n=100 410.alb	1	0	Solution	120.11	14	0.00	0.00
instance n=100 411.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 412.alb	1	0	Solution	120.16	98	0.00	0.00
instance n=100 413.alb	1	0	Solution	120.12	14	0.00	0.00
instance n=100 414.alb	1	0	Solution	120.13	34	0.00	0.00
instance n=100 415.alb	1	0	Solution	120.13	13	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 416.alb	1	0	Solution	120.16	14	0.00	0.00
instance n=100 417.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 418.alb	1	0	Solution	120.13	16	0.00	0.00
instance n=100 419.alb	1	0	Solution	120.13	15	0.00	0.00
instance n=100 42.alb	1	0	Solution	120.12	87	0.00	0.00
instance n=100 420.alb	1	0	Solution	120.13	14	0.00	0.00
instance n=100 421.alb	1	0	Solution	120.11	87	0.00	0.00
instance n=100 422.alb	1	0	Solution	120.13	72	0.00	0.00
instance n=100 423.alb	1	0	Solution	120.13	91	0.00	0.00
instance n=100 424.alb	1	0	Solution	120.13	71	0.00	0.00
instance n=100 425.alb	1	0	Solution	120.14	57	0.00	0.00
instance n=100 426.alb	1	0	Solution	120.13	64	0.00	0.00
instance n=100 427.alb	1	0	Solution	120.13	59	0.00	0.00
instance n=100 428.alb	1	0	Solution	120.12	81	0.00	0.00
instance n=100 429.alb	1	0	Solution	120.14	61	0.00	0.00
instance n=100 43.alb	1	0	Solution	120.12	95	0.00	0.00
instance n=100 430.alb	1	0	Solution	120.12	70	0.00	0.00
instance n=100 431.alb	1	0	Solution	120.13	84	0.00	0.00
instance n=100 432.alb	1	0	Solution	120.11	66	0.00	0.00
instance n=100 433.alb	1	0	Solution	120.13	54	0.00	0.00
instance n=100 434.alb	1	0	Solution	120.13	80	0.00	0.00
instance n=100 435.alb	1	0	Solution	120.13	58	0.00	0.00
instance n=100 436.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 437.alb	1	0	Solution	120.14	56	0.00	0.00
instance n=100 438.alb	1	0	Solution	120.12	72	0.00	0.00
instance n=100 439.alb	1	0	Solution	120.12	58	0.00	0.00
instance n=100 44.alb	1	0	Solution	120.12	83	0.00	0.00
instance n=100 440.alb	1	0	Solution	120.13	80	0.00	0.00
instance n=100 441.alb	1	0	Solution	120.13	61	0.00	0.00
instance n=100 442.alb	1	0	Solution	120.13	53	0.00	0.00
instance n=100 443.alb	1	0	Solution	120.13	56	0.00	0.00
instance n=100 444.alb	1	0	Solution	120.11	56	0.00	0.00
instance n=100 445.alb	1	0	Solution	120.13	56	0.00	0.00
instance n=100 446.alb	1	0	Solution	120.13	58	0.00	0.00
instance n=100 447.alb	1	0	Solution	120.12	63	0.00	0.00
instance n=100 448.alb	1	0	Solution	120.13	58	0.00	0.00
instance n=100 449.alb	1	0	Solution	120.12	56	0.00	0.00
instance n=100 45.alb	1	0	Solution	120.11	89	0.00	0.00
instance n=100 450.alb	1	0	Solution	120.11	56	0.00	0.00
instance n=100 451.alb	1	0	Optimal	14.71	26	0.00	0.00
instance n=100 452.alb	1	0	Optimal	15.47	22	0.00	0.00
instance n=100 453.alb	1	0	Optimal	5.62	24	0.00	0.00
instance n=100 454.alb	1	0	Optimal	6.32	23	0.00	0.00
instance n=100 455.alb	1	0	Optimal	5.70	23	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 456.alb	1	0	Optimal	11.83	26	0.00	0.00
instance n=100 457.alb	1	0	Optimal	2.99	23	0.00	0.00
instance n=100 458.alb	1	0	Optimal	3.47	24	0.00	0.00
instance n=100 459.alb	1	0	Optimal	12.84	23	0.00	0.00
instance n=100 46.alb	1	0	Solution	120.11	73	0.00	0.00
instance n=100 460.alb	1	0	Optimal	3.73	23	0.00	0.00
instance n=100 461.alb	1	0	Optimal	8.19	23	0.00	0.00
instance n=100 462.alb	1	0	Optimal	4.52	23	0.00	0.00
instance n=100 463.alb	1	0	Optimal	11.36	26	0.00	0.00
instance n=100 464.alb	1	0	Optimal	5.05	25	0.00	0.00
instance n=100 465.alb	1	0	Optimal	29.93	22	0.00	0.00
instance n=100 466.alb	1	0	Optimal	3.27	26	0.00	0.00
instance n=100 467.alb	1	0	Optimal	16.69	21	0.00	0.00
instance n=100 468.alb	1	0	Optimal	5.91	25	0.00	0.00
instance n=100 469.alb	1	0	Optimal	3.30	22	0.00	0.00
instance n=100 47.alb	1	0	Solution	120.12	87	0.00	0.00
instance n=100 470.alb	1	0	Optimal	42.09	26	0.00	0.00
instance n=100 471.alb	1	0	Optimal	5.11	26	0.00	0.00
instance n=100 472.alb	1	0	Optimal	2.92	23	0.00	0.00
instance n=100 473.alb	1	0	Optimal	39.84	28	0.00	0.00
instance n=100 474.alb	1	0	Optimal	5.15	23	0.00	0.00
instance n=100 475.alb	1	0	Optimal	3.83	24	0.00	0.00
instance n=100 476.alb	1	0	Optimal	2.01	14	0.00	0.00
instance n=100 477.alb	1	0	Optimal	2.04	14	0.00	0.00
instance n=100 478.alb	1	0	Optimal	8.28	14	0.00	0.00
instance n=100 479.alb	1	0	Optimal	23.13	16	0.00	0.00
instance n=100 48.alb	1	0	Solution	120.13	73	0.00	0.00
instance n=100 480.alb	1	0	Optimal	14.67	15	0.00	0.00
instance n=100 481.alb	1	0	Optimal	5.84	15	0.00	0.00
instance n=100 482.alb	1	0	Optimal	3.86	15	0.00	0.00
instance n=100 483.alb	1	0	Optimal	2.40	14	0.00	0.00
instance n=100 484.alb	1	0	Optimal	2.22	14	0.00	0.00
instance n=100 485.alb	1	0	Optimal	38.95	16	0.00	0.00
instance n=100 486.alb	1	0	Optimal	4.10	15	0.00	0.00
instance n=100 487.alb	1	0	Optimal	3.00	15	0.00	0.00
instance n=100 488.alb	1	0	Optimal	9.25	16	0.00	0.00
instance n=100 489.alb	1	0	Optimal	3.87	13	0.00	0.00
instance n=100 49.alb	1	0	Solution	120.13	97	0.00	0.00
instance n=100 490.alb	1	0	Optimal	2.91	15	0.00	0.00
instance n=100 491.alb	1	0	Optimal	53.45	16	0.00	0.00
instance n=100 492.alb	1	0	Optimal	12.27	14	0.00	0.00
instance n=100 493.alb	1	0	Optimal	5.24	14	0.00	0.00
instance n=100 494.alb	1	0	Optimal	5.77	14	0.00	0.00
instance n=100 495.alb	1	0	Optimal	7.38	15	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 496.alb	1	0	Optimal	6.50	14	0.00	0.00
instance n=100 497.alb	1	0	Optimal	11.98	13	0.00	0.00
instance n=100 498.alb	1	0	Optimal	5.10	14	0.00	0.00
instance n=100 499.alb	1	0	Optimal	2.34	14	0.00	0.00
instance n=100 5.alb	1	0	Solution	120.12	92	0.00	0.00
instance n=100 50.alb	1	0	Solution	120.11	57	0.00	0.00
instance n=100 500.alb	1	0	Optimal	2.88	14	0.00	0.00
instance n=100 501.alb	1	0	Optimal	3.02	62	0.00	0.00
instance n=100 502.alb	1	0	Optimal	6.87	64	0.00	0.00
instance n=100 503.alb	1	0	Optimal	5.92	60	0.00	0.00
instance n=100 504.alb	1	0	Optimal	61.67	60	0.00	0.00
instance n=100 505.alb	1	0	Optimal	62.69	61	0.00	0.00
instance n=100 506.alb	1	0	Optimal	20.14	57	0.00	0.00
instance n=100 507.alb	1	0	Optimal	5.99	59	0.00	0.00
instance n=100 508.alb	1	0	Optimal	12.72	56	0.00	0.00
instance n=100 509.alb	1	0	Optimal	10.10	57	0.00	0.00
instance n=100 51.alb	1	0	Solution	120.13	83	0.00	0.00
instance n=100 510.alb	1	0	Optimal	26.78	58	0.00	0.00
instance n=100 511.alb	1	0	Optimal	12.13	59	0.00	0.00
instance n=100 512.alb	1	0	Optimal	12.59	60	0.00	0.00
instance n=100 513.alb	1	0	Optimal	6.81	62	0.00	0.00
instance n=100 514.alb	1	0	Optimal	19.41	58	0.00	0.00
instance n=100 515.alb	1	0	Optimal	7.06	61	0.00	0.00
instance n=100 516.alb	1	0	Optimal	16.62	70	0.00	0.00
instance n=100 517.alb	1	0	Optimal	5.35	62	0.00	0.00
instance n=100 518.alb	1	0	Optimal	13.04	57	0.00	0.00
instance n=100 519.alb	1	0	Optimal	4.73	61	0.00	0.00
instance n=100 52.alb	1	0	Solution	120.12	85	0.00	0.00
instance n=100 520.alb	1	0	Optimal	5.08	60	0.00	0.00
instance n=100 521.alb	1	0	Optimal	5.66	70	0.00	0.00
instance n=100 522.alb	1	0	Optimal	90.00	59	0.00	0.00
instance n=100 523.alb	1	0	Optimal	12.87	55	0.00	0.00
instance n=100 524.alb	1	0	Optimal	17.22	59	0.00	0.00
instance n=100 525.alb	1	0	Optimal	10.31	62	0.00	0.00
instance n=100 53.alb	1	0	Solution	120.13	89	0.00	0.00
instance n=100 54.alb	1	0	Solution	120.13	95	0.00	0.00
instance n=100 55.alb	1	0	Solution	120.12	89	0.00	0.00
instance n=100 56.alb	1	0	Solution	120.11	75	0.00	0.00
instance n=100 57.alb	1	0	Solution	120.12	89	0.00	0.00
instance n=100 58.alb	1	0	Solution	120.14	92	0.00	0.00
instance n=100 59.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 6.alb	1	0	Solution	120.13	83	0.00	0.00
instance n=100 60.alb	1	0	Solution	120.12	76	0.00	0.00
instance n=100 61.alb	1	0	Solution	120.12	79	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 62.alb	1	0	Solution	120.11	57	0.00	0.00
instance n=100 63.alb	1	0	Solution	120.12	96	0.00	0.00
instance n=100 64.alb	1	0	Solution	120.11	88	0.00	0.00
instance n=100 65.alb	1	0	Solution	120.11	83	0.00	0.00
instance n=100 66.alb	1	0	Solution	120.13	98	0.00	0.00
instance n=100 67.alb	1	0	Solution	120.12	87	0.00	0.00
instance n=100 68.alb	1	0	Solution	120.11	86	0.00	0.00
instance n=100 69.alb	1	0	Solution	120.13	99	0.00	0.00
instance n=100 7.alb	1	0	Solution	120.13	53	0.00	0.00
instance n=100 70.alb	1	0	Solution	120.13	88	0.00	0.00
instance n=100 71.alb	1	0	Solution	120.13	91	0.00	0.00
instance n=100 72.alb	1	0	Solution	120.12	82	0.00	0.00
instance n=100 73.alb	1	0	Solution	120.12	89	0.00	0.00
instance n=100 74.alb	1	0	Solution	120.12	93	0.00	0.00
instance n=100 75.alb	1	0	Solution	120.13	87	0.00	0.00
instance n=100 76.alb	1	0	Solution	120.13	86	0.00	0.00
instance n=100 77.alb	1	0	Solution	120.13	71	0.00	0.00
instance n=100 78.alb	1	0	Solution	120.13	43	0.00	0.00
instance n=100 79.alb	1	0	Solution	120.13	73	0.00	0.00
instance n=100 8.alb	1	0	Solution	120.11	69	0.00	0.00
instance n=100 80.alb	1	0	Solution	120.13	23	0.00	0.00
instance n=100 81.alb	1	0	Solution	120.14	54	0.00	0.00
instance n=100 82.alb	1	0	Solution	120.12	90	0.00	0.00
instance n=100 83.alb	1	0	Solution	120.12	90	0.00	0.00
instance n=100 84.alb	1	0	Solution	120.13	86	0.00	0.00
instance n=100 85.alb	1	0	Solution	120.12	25	0.00	0.00
instance n=100 86.alb	1	0	Solution	120.12	23	0.00	0.00
instance n=100 87.alb	1	0	Solution	120.13	74	0.00	0.00
instance n=100 88.alb	1	0	Solution	120.16	43	0.00	0.00
instance n=100 89.alb	1	0	Solution	120.14	45	0.00	0.00
instance n=100 9.alb	1	0	Solution	120.11	80	0.00	0.00
instance n=100 90.alb	1	0	Solution	120.12	75	0.00	0.00
instance n=100 91.alb	1	0	Solution	120.17	77	0.00	0.00
instance n=100 92.alb	1	0	Solution	120.13	24	0.00	0.00
instance n=100 93.alb	1	0	Solution	120.13	28	0.00	0.00
instance n=100 94.alb	1	0	Solution	120.12	91	0.00	0.00
instance n=100 95.alb	1	0	Solution	120.13	22	0.00	0.00
instance n=100 96.alb	1	0	Solution	120.12	22	0.00	0.00
instance n=100 97.alb	1	0	Solution	120.14	22	0.00	0.00
instance n=100 98.alb	1	0	Solution	120.13	63	0.00	0.00
instance n=100 99.alb	1	0	Solution	120.13	32	0.00	0.00
instance n=20 1.alb	1	0	Optimal	0.51	3	0.00	0.00
instance n=20 10.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 100.alb	1	0	Optimal	0.26	11	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 101.alb	1	0	Optimal	0.32	13	0.00	0.00
instance n=20 102.alb	1	0	Optimal	0.26	13	0.00	0.00
instance n=20 103.alb	1	0	Optimal	0.29	12	0.00	0.00
instance n=20 104.alb	1	0	Optimal	0.25	11	0.00	0.00
instance n=20 105.alb	1	0	Optimal	0.26	12	0.00	0.00
instance n=20 106.alb	1	0	Optimal	0.25	10	0.00	0.00
instance n=20 107.alb	1	0	Optimal	0.33	14	0.00	0.00
instance n=20 108.alb	1	0	Optimal	0.29	15	0.00	0.00
instance n=20 109.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 11.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 110.alb	1	0	Optimal	0.26	11	0.00	0.00
instance n=20 111.alb	1	0	Optimal	0.25	13	0.00	0.00
instance n=20 112.alb	1	0	Optimal	0.24	11	0.00	0.00
instance n=20 113.alb	1	0	Optimal	0.26	12	0.00	0.00
instance n=20 114.alb	1	0	Optimal	0.26	13	0.00	0.00
instance n=20 115.alb	1	0	Optimal	0.24	11	0.00	0.00
instance n=20 116.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 117.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 118.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 119.alb	1	0	Optimal	0.22	6	0.00	0.00
instance n=20 12.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 120.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 121.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 122.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 123.alb	1	0	Optimal	0.26	5	0.00	0.00
instance n=20 124.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 125.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 126.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 127.alb	1	0	Optimal	0.25	4	0.00	0.00
instance n=20 128.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 129.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 13.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 130.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 131.alb	1	0	Optimal	0.23	7	0.00	0.00
instance n=20 132.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 133.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 134.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 135.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 136.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 137.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 138.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 139.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 14.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 140.alb	1	0	Optimal	0.25	5	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 141.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 142.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 143.alb	1	0	Optimal	0.22	3	0.00	0.00
instance n=20 144.alb	1	0	Optimal	0.25	4	0.00	0.00
instance n=20 145.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 146.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 147.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 148.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 149.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 15.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 150.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 151.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 152.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 153.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 154.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 155.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 156.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 157.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 158.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 159.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 16.alb	1	0	Optimal	0.30	12	0.00	0.00
instance n=20 160.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 161.alb	1	0	Optimal	0.22	3	0.00	0.00
instance n=20 162.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 163.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 164.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 165.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 166.alb	1	0	Optimal	0.37	12	0.00	0.00
instance n=20 167.alb	1	0	Optimal	0.59	11	0.00	0.00
instance n=20 168.alb	1	0	Optimal	0.27	10	0.00	0.00
instance n=20 169.alb	1	0	Optimal	0.31	11	0.00	0.00
instance n=20 17.alb	1	0	Optimal	0.27	10	0.00	0.00
instance n=20 170.alb	1	0	Optimal	0.32	11	0.00	0.00
instance n=20 171.alb	1	0	Optimal	1.97	13	0.00	0.00
instance n=20 172.alb	1	0	Optimal	0.40	11	0.00	0.00
instance n=20 173.alb	1	0	Optimal	0.33	11	0.00	0.00
instance n=20 174.alb	1	0	Optimal	0.33	12	0.00	0.00
instance n=20 175.alb	1	0	Optimal	0.26	10	0.00	0.00
instance n=20 176.alb	1	0	Optimal	0.34	11	0.00	0.00
instance n=20 177.alb	1	0	Optimal	0.49	10	0.00	0.00
instance n=20 178.alb	1	0	Optimal	0.31	11	0.00	0.00
instance n=20 179.alb	1	0	Optimal	0.31	11	0.00	0.00
instance n=20 18.alb	1	0	Optimal	0.26	11	0.00	0.00
instance n=20 180.alb	1	0	Optimal	0.45	13	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 181.alb	1	0	Optimal	0.25	11	0.00	0.00
instance n=20 182.alb	1	0	Optimal	0.85	11	0.00	0.00
instance n=20 183.alb	1	0	Optimal	0.64	13	0.00	0.00
instance n=20 184.alb	1	0	Optimal	0.33	12	0.00	0.00
instance n=20 185.alb	1	0	Optimal	0.45	15	0.00	0.00
instance n=20 186.alb	1	0	Optimal	0.56	14	0.00	0.00
instance n=20 187.alb	1	0	Optimal	0.23	10	0.00	0.00
instance n=20 188.alb	1	0	Optimal	0.30	11	0.00	0.00
instance n=20 189.alb	1	0	Optimal	0.30	13	0.00	0.00
instance n=20 19.alb	1	0	Optimal	0.50	14	0.00	0.00
instance n=20 190.alb	1	0	Optimal	0.84	15	0.00	0.00
instance n=20 191.alb	1	0	Optimal	0.23	4	0.00	0.00
instance n=20 192.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 193.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 194.alb	1	0	Optimal	0.26	6	0.00	0.00
instance n=20 195.alb	1	0	Optimal	0.30	6	0.00	0.00
instance n=20 196.alb	1	0	Optimal	0.26	5	0.00	0.00
instance n=20 197.alb	1	0	Optimal	0.22	4	0.00	0.00
instance n=20 198.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 199.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 2.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 20.alb	1	0	Optimal	0.37	11	0.00	0.00
instance n=20 200.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 201.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=20 202.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 203.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 204.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 205.alb	1	0	Optimal	0.29	6	0.00	0.00
instance n=20 206.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 207.alb	1	0	Optimal	0.29	6	0.00	0.00
instance n=20 208.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 209.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 21.alb	1	0	Optimal	0.31	14	0.00	0.00
instance n=20 210.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 211.alb	1	0	Optimal	0.26	5	0.00	0.00
instance n=20 212.alb	1	0	Optimal	0.26	5	0.00	0.00
instance n=20 213.alb	1	0	Optimal	0.27	5	0.00	0.00
instance n=20 214.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 215.alb	1	0	Optimal	0.26	5	0.00	0.00
instance n=20 216.alb	1	0	Optimal	0.22	3	0.00	0.00
instance n=20 217.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 218.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 219.alb	1	0	Optimal	0.22	3	0.00	0.00
instance n=20 22.alb	1	0	Optimal	0.28	12	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 220.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 221.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 222.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 223.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 224.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 225.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 226.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 227.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 228.alb	1	0	Optimal	0.24	2	0.00	0.00
instance n=20 229.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 23.alb	1	0	Optimal	0.68	13	0.00	0.00
instance n=20 230.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 231.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 232.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 233.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 234.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 235.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 236.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 237.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 238.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 239.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 24.alb	1	0	Optimal	0.30	11	0.00	0.00
instance n=20 240.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 241.alb	1	0	Optimal	0.23	13	0.00	0.00
instance n=20 242.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 243.alb	1	0	Optimal	0.26	10	0.00	0.00
instance n=20 244.alb	1	0	Optimal	0.24	11	0.00	0.00
instance n=20 245.alb	1	0	Optimal	0.23	13	0.00	0.00
instance n=20 246.alb	1	0	Optimal	0.29	13	0.00	0.00
instance n=20 247.alb	1	0	Optimal	0.24	11	0.00	0.00
instance n=20 248.alb	1	0	Optimal	0.25	11	0.00	0.00
instance n=20 249.alb	1	0	Optimal	0.27	13	0.00	0.00
instance n=20 25.alb	1	0	Optimal	0.28	11	0.00	0.00
instance n=20 250.alb	1	0	Optimal	0.25	10	0.00	0.00
instance n=20 251.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 252.alb	1	0	Optimal	0.24	11	0.00	0.00
instance n=20 253.alb	1	0	Optimal	0.25	13	0.00	0.00
instance n=20 254.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 255.alb	1	0	Optimal	0.26	13	0.00	0.00
instance n=20 256.alb	1	0	Optimal	0.25	14	0.00	0.00
instance n=20 257.alb	1	0	Optimal	0.24	10	0.00	0.00
instance n=20 258.alb	1	0	Optimal	0.24	13	0.00	0.00
instance n=20 259.alb	1	0	Optimal	0.25	13	0.00	0.00
instance n=20 26.alb	1	0	Optimal	0.28	12	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 260.alb	1	0	Optimal	0.27	12	0.00	0.00
instance n=20 261.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 262.alb	1	0	Optimal	0.24	11	0.00	0.00
instance n=20 263.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 264.alb	1	0	Optimal	0.26	12	0.00	0.00
instance n=20 265.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 266.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 267.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 268.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 269.alb	1	0	Optimal	0.25	7	0.00	0.00
instance n=20 27.alb	1	0	Optimal	0.40	13	0.00	0.00
instance n=20 270.alb	1	0	Optimal	0.24	7	0.00	0.00
instance n=20 271.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 272.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 273.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 274.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 275.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 276.alb	1	0	Optimal	0.23	4	0.00	0.00
instance n=20 277.alb	1	0	Optimal	0.25	4	0.00	0.00
instance n=20 278.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 279.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 28.alb	1	0	Optimal	0.45	12	0.00	0.00
instance n=20 280.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 281.alb	1	0	Optimal	0.25	4	0.00	0.00
instance n=20 282.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 283.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 284.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 285.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 286.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 287.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 288.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 289.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 29.alb	1	0	Optimal	0.95	10	0.00	0.00
instance n=20 290.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 291.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 292.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 293.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 294.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 295.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 296.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 297.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 298.alb	1	0	Optimal	0.22	3	0.00	0.00
instance n=20 299.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 3.alb	1	0	Optimal	0.25	3	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 30.alb	1	0	Optimal	0.57	16	0.00	0.00
instance n=20 300.alb	1	0	Optimal	0.25	4	0.00	0.00
instance n=20 301.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 302.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 303.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 304.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 305.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 306.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 307.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 308.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 309.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 31.alb	1	0	Optimal	0.27	12	0.00	0.00
instance n=20 310.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 311.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 312.alb	1	0	Optimal	0.23	4	0.00	0.00
instance n=20 313.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 314.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 315.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 316.alb	1	0	Optimal	1.11	10	0.00	0.00
instance n=20 317.alb	1	0	Optimal	0.90	10	0.00	0.00
instance n=20 318.alb	1	0	Optimal	0.25	10	0.00	0.00
instance n=20 319.alb	1	0	Optimal	0.37	14	0.00	0.00
instance n=20 32.alb	1	0	Optimal	0.77	13	0.00	0.00
instance n=20 320.alb	1	0	Optimal	0.27	12	0.00	0.00
instance n=20 321.alb	1	0	Optimal	2.38	14	0.00	0.00
instance n=20 322.alb	1	0	Optimal	0.42	12	0.00	0.00
instance n=20 323.alb	1	0	Optimal	0.37	13	0.00	0.00
instance n=20 324.alb	1	0	Optimal	0.53	9	0.00	0.00
instance n=20 325.alb	1	0	Optimal	0.65	14	0.00	0.00
instance n=20 326.alb	1	0	Optimal	0.52	14	0.00	0.00
instance n=20 327.alb	1	0	Optimal	0.43	13	0.00	0.00
instance n=20 328.alb	1	0	Optimal	0.45	13	0.00	0.00
instance n=20 329.alb	1	0	Optimal	0.31	10	0.00	0.00
instance n=20 33.alb	1	0	Optimal	0.28	11	0.00	0.00
instance n=20 330.alb	1	0	Optimal	0.43	12	0.00	0.00
instance n=20 331.alb	1	0	Optimal	1.50	13	0.00	0.00
instance n=20 332.alb	1	0	Optimal	0.40	13	0.00	0.00
instance n=20 333.alb	1	0	Optimal	0.35	11	0.00	0.00
instance n=20 334.alb	1	0	Optimal	0.28	10	0.00	0.00
instance n=20 335.alb	1	0	Optimal	1.94	14	0.00	0.00
instance n=20 336.alb	1	0	Optimal	0.27	11	0.00	0.00
instance n=20 337.alb	1	0	Optimal	0.31	10	0.00	0.00
instance n=20 338.alb	1	0	Optimal	0.44	14	0.00	0.00
instance n=20 339.alb	1	0	Optimal	0.45	13	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 34.alb	1	0	Optimal	0.29	12	0.00	0.00
instance n=20 340.alb	1	0	Optimal	0.27	11	0.00	0.00
instance n=20 341.alb	1	0	Optimal	0.28	6	0.00	0.00
instance n=20 342.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 343.alb	1	0	Optimal	0.49	6	0.00	0.00
instance n=20 344.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 345.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 346.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 347.alb	1	0	Optimal	0.44	6	0.00	0.00
instance n=20 348.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 349.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 35.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 350.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 351.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 352.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 353.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 354.alb	1	0	Optimal	0.30	6	0.00	0.00
instance n=20 355.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 356.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 357.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 358.alb	1	0	Optimal	0.23	4	0.00	0.00
instance n=20 359.alb	1	0	Optimal	0.26	4	0.00	0.00
instance n=20 36.alb	1	0	Optimal	0.28	13	0.00	0.00
instance n=20 360.alb	1	0	Optimal	0.28	6	0.00	0.00
instance n=20 361.alb	1	0	Optimal	0.26	5	0.00	0.00
instance n=20 362.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 363.alb	1	0	Optimal	0.70	7	0.00	0.00
instance n=20 364.alb	1	0	Optimal	0.22	4	0.00	0.00
instance n=20 365.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 366.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 367.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 368.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 369.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 37.alb	1	0	Optimal	0.32	12	0.00	0.00
instance n=20 370.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 371.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 372.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 373.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 374.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 375.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 376.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 377.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 378.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 379.alb	1	0	Optimal	0.22	4	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 38.alb	1	0	Optimal	0.27	12	0.00	0.00
instance n=20 380.alb	1	0	Optimal	0.22	3	0.00	0.00
instance n=20 381.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 382.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 383.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 384.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 385.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 386.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 387.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 388.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 389.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 39.alb	1	0	Optimal	0.25	13	0.00	0.00
instance n=20 390.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 391.alb	1	0	Optimal	0.25	11	0.00	0.00
instance n=20 392.alb	1	0	Optimal	0.27	14	0.00	0.00
instance n=20 393.alb	1	0	Optimal	0.24	11	0.00	0.00
instance n=20 394.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 395.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 396.alb	1	0	Optimal	0.25	13	0.00	0.00
instance n=20 397.alb	1	0	Optimal	0.25	10	0.00	0.00
instance n=20 398.alb	1	0	Optimal	0.23	11	0.00	0.00
instance n=20 399.alb	1	0	Optimal	0.26	13	0.00	0.00
instance n=20 4.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 40.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=20 400.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 401.alb	1	0	Optimal	0.26	12	0.00	0.00
instance n=20 402.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 403.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 404.alb	1	0	Optimal	0.26	10	0.00	0.00
instance n=20 405.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 406.alb	1	0	Optimal	0.25	14	0.00	0.00
instance n=20 407.alb	1	0	Optimal	0.25	10	0.00	0.00
instance n=20 408.alb	1	0	Optimal	0.25	14	0.00	0.00
instance n=20 409.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 41.alb	1	0	Optimal	0.29	6	0.00	0.00
instance n=20 410.alb	1	0	Optimal	0.25	11	0.00	0.00
instance n=20 411.alb	1	0	Optimal	0.26	15	0.00	0.00
instance n=20 412.alb	1	0	Optimal	0.25	11	0.00	0.00
instance n=20 413.alb	1	0	Optimal	0.24	10	0.00	0.00
instance n=20 414.alb	1	0	Optimal	0.26	12	0.00	0.00
instance n=20 415.alb	1	0	Optimal	0.25	10	0.00	0.00
instance n=20 416.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 417.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 418.alb	1	0	Optimal	0.24	6	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 419.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 42.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 420.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 421.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 422.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 423.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 424.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 425.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 426.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 427.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 428.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 429.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 43.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 430.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 431.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 432.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 433.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 434.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 435.alb	1	0	Optimal	0.24	7	0.00	0.00
instance n=20 436.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 437.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 438.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 439.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 44.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 440.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 441.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 442.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 443.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 444.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 445.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 446.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 447.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 448.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 449.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 45.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 450.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 451.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 452.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 453.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 454.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 455.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 456.alb	1	0	Optimal	0.23	4	0.00	0.00
instance n=20 457.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 458.alb	1	0	Optimal	0.24	3	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 459.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 46.alb	1	0	Optimal	0.25	4	0.00	0.00
instance n=20 460.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 461.alb	1	0	Optimal	0.26	3	0.00	0.00
instance n=20 462.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 463.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 464.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 465.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 466.alb	1	0	Optimal	0.24	13	0.00	0.00
instance n=20 467.alb	1	0	Optimal	0.24	14	0.00	0.00
instance n=20 468.alb	1	0	Optimal	0.25	13	0.00	0.00
instance n=20 469.alb	1	0	Optimal	0.23	14	0.00	0.00
instance n=20 47.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 470.alb	1	0	Optimal	0.23	12	0.00	0.00
instance n=20 471.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 472.alb	1	0	Optimal	0.23	13	0.00	0.00
instance n=20 473.alb	1	0	Optimal	0.24	10	0.00	0.00
instance n=20 474.alb	1	0	Optimal	0.25	14	0.00	0.00
instance n=20 475.alb	1	0	Optimal	0.23	11	0.00	0.00
instance n=20 476.alb	1	0	Optimal	0.23	11	0.00	0.00
instance n=20 477.alb	1	0	Optimal	0.23	11	0.00	0.00
instance n=20 478.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 479.alb	1	0	Optimal	0.23	13	0.00	0.00
instance n=20 48.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 480.alb	1	0	Optimal	0.24	13	0.00	0.00
instance n=20 481.alb	1	0	Optimal	0.24	13	0.00	0.00
instance n=20 482.alb	1	0	Optimal	0.23	13	0.00	0.00
instance n=20 483.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 484.alb	1	0	Optimal	0.25	13	0.00	0.00
instance n=20 485.alb	1	0	Optimal	0.24	15	0.00	0.00
instance n=20 486.alb	1	0	Optimal	0.23	11	0.00	0.00
instance n=20 487.alb	1	0	Optimal	0.24	12	0.00	0.00
instance n=20 488.alb	1	0	Optimal	0.25	15	0.00	0.00
instance n=20 489.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 49.alb	1	0	Optimal	0.23	4	0.00	0.00
instance n=20 490.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 491.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 492.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 493.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 494.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 495.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 496.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 497.alb	1	0	Optimal	0.26	6	0.00	0.00
instance n=20 498.alb	1	0	Optimal	0.24	6	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 499.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 5.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 50.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 500.alb	1	0	Optimal	0.23	8	0.00	0.00
instance n=20 501.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 502.alb	1	0	Optimal	0.26	4	0.00	0.00
instance n=20 503.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 504.alb	1	0	Optimal	0.24	6	0.00	0.00
instance n=20 505.alb	1	0	Optimal	0.23	6	0.00	0.00
instance n=20 506.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 507.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 508.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 509.alb	1	0	Optimal	0.25	4	0.00	0.00
instance n=20 51.alb	1	0	Optimal	0.22	4	0.00	0.00
instance n=20 510.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 511.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 512.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 513.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 514.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 515.alb	1	0	Optimal	0.25	6	0.00	0.00
instance n=20 516.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 517.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 518.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 519.alb	1	0	Optimal	0.26	3	0.00	0.00
instance n=20 52.alb	1	0	Optimal	0.23	4	0.00	0.00
instance n=20 520.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 521.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 522.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 523.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 524.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 525.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 53.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 54.alb	1	0	Optimal	0.23	5	0.00	0.00
instance n=20 55.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 56.alb	1	0	Optimal	0.24	4	0.00	0.00
instance n=20 57.alb	1	0	Optimal	0.23	4	0.00	0.00
instance n=20 58.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 59.alb	1	0	Optimal	0.26	4	0.00	0.00
instance n=20 6.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 60.alb	1	0	Optimal	0.58	6	0.00	0.00
instance n=20 61.alb	1	0	Optimal	0.26	7	0.00	0.00
instance n=20 62.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 63.alb	1	0	Optimal	0.25	5	0.00	0.00
instance n=20 64.alb	1	0	Optimal	0.26	5	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 65.alb	1	0	Optimal	0.24	5	0.00	0.00
instance n=20 66.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 67.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 68.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 69.alb	1	0	Optimal	0.24	2	0.00	0.00
instance n=20 7.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 70.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 71.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 72.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 73.alb	1	0	Optimal	0.24	2	0.00	0.00
instance n=20 74.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 75.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 76.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 77.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 78.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 79.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 8.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 80.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 81.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 82.alb	1	0	Optimal	0.25	4	0.00	0.00
instance n=20 83.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 84.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 85.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 86.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 87.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 88.alb	1	0	Optimal	0.23	3	0.00	0.00
instance n=20 89.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 9.alb	1	0	Optimal	0.25	3	0.00	0.00
instance n=20 90.alb	1	0	Optimal	0.24	3	0.00	0.00
instance n=20 91.alb	1	0	Optimal	0.24	11	0.00	0.00
instance n=20 92.alb	1	0	Optimal	0.23	11	0.00	0.00
instance n=20 93.alb	1	0	Optimal	0.27	13	0.00	0.00
instance n=20 94.alb	1	0	Optimal	0.25	10	0.00	0.00
instance n=20 95.alb	1	0	Optimal	0.25	12	0.00	0.00
instance n=20 96.alb	1	0	Optimal	0.25	10	0.00	0.00
instance n=20 97.alb	1	0	Optimal	0.30	15	0.00	0.00
instance n=20 98.alb	1	0	Optimal	0.26	13	0.00	0.00
instance n=20 99.alb	1	0	Optimal	0.27	12	0.00	0.00
instance n=50 1.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 10.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 100.alb	1	0	Optimal	1.34	7	0.00	0.00
instance n=50 101.alb	1	0	Optimal	15.64	30	0.00	0.00
instance n=50 102.alb	1	0	Optimal	14.72	32	0.00	0.00
instance n=50 103.alb	1	0	Optimal	29.99	29	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 104.alb	1	0	Optimal	1.86	27	0.00	0.00
instance n=50 105.alb	1	0	Solution	30.07	24	0.00	0.00
instance n=50 106.alb	1	0	Optimal	10.20	28	0.00	0.00
instance n=50 107.alb	1	0	Optimal	5.48	28	0.00	0.00
instance n=50 108.alb	1	0	Optimal	25.74	30	0.00	0.00
instance n=50 109.alb	1	0	Optimal	5.94	30	0.00	0.00
instance n=50 11.alb	1	0	Solution	30.07	7	0.00	0.00
instance n=50 110.alb	1	0	Solution	30.07	27	0.00	0.00
instance n=50 111.alb	1	0	Optimal	2.37	28	0.00	0.00
instance n=50 112.alb	1	0	Optimal	2.83	27	0.00	0.00
instance n=50 113.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 114.alb	1	0	Optimal	5.26	27	0.00	0.00
instance n=50 115.alb	1	0	Solution	30.07	29	0.00	0.00
instance n=50 116.alb	1	0	Optimal	14.07	32	0.00	0.00
instance n=50 117.alb	1	0	Optimal	9.98	27	0.00	0.00
instance n=50 118.alb	1	0	Optimal	2.58	29	0.00	0.00
instance n=50 119.alb	1	0	Optimal	6.11	25	0.00	0.00
instance n=50 12.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 120.alb	1	0	Optimal	3.50	27	0.00	0.00
instance n=50 121.alb	1	0	Optimal	6.45	32	0.00	0.00
instance n=50 122.alb	1	0	Optimal	11.70	29	0.00	0.00
instance n=50 123.alb	1	0	Optimal	12.53	32	0.00	0.00
instance n=50 124.alb	1	0	Optimal	8.08	29	0.00	0.00
instance n=50 125.alb	1	0	Solution	30.05	33	0.00	0.00
instance n=50 126.alb	1	0	Optimal	10.18	12	0.00	0.00
instance n=50 127.alb	1	0	Optimal	3.28	14	0.00	0.00
instance n=50 128.alb	1	0	Optimal	4.33	12	0.00	0.00
instance n=50 129.alb	1	0	Optimal	11.79	13	0.00	0.00
instance n=50 13.alb	1	0	Solution	30.06	6	0.00	0.00
instance n=50 130.alb	1	0	Optimal	6.71	13	0.00	0.00
instance n=50 131.alb	1	0	Optimal	3.67	12	0.00	0.00
instance n=50 132.alb	1	0	Optimal	13.49	12	0.00	0.00
instance n=50 133.alb	1	0	Optimal	4.76	12	0.00	0.00
instance n=50 134.alb	1	0	Optimal	2.63	14	0.00	0.00
instance n=50 135.alb	1	0	Optimal	5.17	13	0.00	0.00
instance n=50 136.alb	1	0	Optimal	5.89	11	0.00	0.00
instance n=50 137.alb	1	0	Optimal	6.50	11	0.00	0.00
instance n=50 138.alb	1	0	Optimal	4.26	12	0.00	0.00
instance n=50 139.alb	1	0	Optimal	11.13	11	0.00	0.00
instance n=50 14.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 140.alb	1	0	Optimal	1.44	12	0.00	0.00
instance n=50 141.alb	1	0	Optimal	2.72	13	0.00	0.00
instance n=50 142.alb	1	0	Optimal	4.07	11	0.00	0.00
instance n=50 143.alb	1	0	Optimal	0.56	12	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 144.alb	1	0	Optimal	1.24	13	0.00	0.00
instance n=50 145.alb	1	0	Optimal	1.21	10	0.00	0.00
instance n=50 146.alb	1	0	Optimal	1.48	13	0.00	0.00
instance n=50 147.alb	1	0	Optimal	8.57	13	0.00	0.00
instance n=50 148.alb	1	0	Optimal	4.22	10	0.00	0.00
instance n=50 149.alb	1	0	Optimal	1.32	12	0.00	0.00
instance n=50 15.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 150.alb	1	0	Optimal	1.38	11	0.00	0.00
instance n=50 151.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 152.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 153.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 154.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 155.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 156.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 157.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 158.alb	1	0	Solution	30.06	46	0.00	0.00
instance n=50 159.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 16.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 160.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 161.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 162.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 163.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 164.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 165.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 166.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 167.alb	1	0	Solution	30.07	8	0.00	0.00
instance n=50 168.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 169.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 17.alb	1	0	Solution	30.07	7	0.00	0.00
instance n=50 170.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 171.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 172.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 173.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 174.alb	1	0	Solution	30.07	7	0.00	0.00
instance n=50 175.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 176.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 177.alb	1	0	Solution	30.07	28	0.00	0.00
instance n=50 178.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 179.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 18.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 180.alb	1	0	Solution	30.07	26	0.00	0.00
instance n=50 181.alb	1	0	Solution	30.06	31	0.00	0.00
instance n=50 182.alb	1	0	Solution	30.05	27	0.00	0.00
instance n=50 183.alb	1	0	Solution	30.06	28	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 184.alb	1	0	Solution	30.05	40	0.00	0.00
instance n=50 185.alb	1	0	Solution	30.06	26	0.00	0.00
instance n=50 186.alb	1	0	Solution	30.07	27	0.00	0.00
instance n=50 187.alb	1	0	Solution	30.06	26	0.00	0.00
instance n=50 188.alb	1	0	Solution	30.06	25	0.00	0.00
instance n=50 189.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 19.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 190.alb	1	0	Solution	30.06	31	0.00	0.00
instance n=50 191.alb	1	0	Solution	30.06	30	0.00	0.00
instance n=50 192.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 193.alb	1	0	Solution	30.05	29	0.00	0.00
instance n=50 194.alb	1	0	Solution	30.06	39	0.00	0.00
instance n=50 195.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 196.alb	1	0	Solution	30.07	28	0.00	0.00
instance n=50 197.alb	1	0	Solution	30.07	29	0.00	0.00
instance n=50 198.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 199.alb	1	0	Solution	30.06	29	0.00	0.00
instance n=50 2.alb	1	0	Solution	30.06	6	0.00	0.00
instance n=50 20.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 200.alb	1	0	Solution	30.07	37	0.00	0.00
instance n=50 201.alb	1	0	Solution	30.05	13	0.00	0.00
instance n=50 202.alb	1	0	Solution	30.06	9	0.00	0.00
instance n=50 203.alb	1	0	Solution	30.06	11	0.00	0.00
instance n=50 204.alb	1	0	Solution	30.06	11	0.00	0.00
instance n=50 205.alb	1	0	Solution	30.07	13	0.00	0.00
instance n=50 206.alb	1	0	Solution	30.06	12	0.00	0.00
instance n=50 207.alb	1	0	Solution	30.07	10	0.00	0.00
instance n=50 208.alb	1	0	Solution	30.05	50	0.00	0.00
instance n=50 209.alb	1	0	Solution	30.06	11	0.00	0.00
instance n=50 21.alb	1	0	Solution	30.07	6	0.00	0.00
instance n=50 210.alb	1	0	Solution	30.06	13	0.00	0.00
instance n=50 211.alb	1	0	Solution	30.06	12	0.00	0.00
instance n=50 212.alb	1	0	Solution	30.05	10	0.00	0.00
instance n=50 213.alb	1	0	Solution	30.06	13	0.00	0.00
instance n=50 214.alb	1	0	Solution	30.07	11	0.00	0.00
instance n=50 215.alb	1	0	Solution	30.06	11	0.00	0.00
instance n=50 216.alb	1	0	Solution	30.06	12	0.00	0.00
instance n=50 217.alb	1	0	Solution	30.07	13	0.00	0.00
instance n=50 218.alb	1	0	Solution	30.06	12	0.00	0.00
instance n=50 219.alb	1	0	Solution	30.06	11	0.00	0.00
instance n=50 22.alb	1	0	Solution	30.06	44	0.00	0.00
instance n=50 220.alb	1	0	Solution	30.07	11	0.00	0.00
instance n=50 221.alb	1	0	Solution	30.06	11	0.00	0.00
instance n=50 222.alb	1	0	Solution	30.06	14	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 223.alb	1	0	Solution	30.04	11	0.00	0.00
instance n=50 224.alb	1	0	Solution	30.07	11	0.00	0.00
instance n=50 225.alb	1	0	Solution	30.07	12	0.00	0.00
instance n=50 226.alb	1	0	Optimal	0.77	7	0.00	0.00
instance n=50 227.alb	1	0	Optimal	0.64	6	0.00	0.00
instance n=50 228.alb	1	0	Optimal	1.39	6	0.00	0.00
instance n=50 229.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=50 23.alb	1	0	Solution	30.07	7	0.00	0.00
instance n=50 230.alb	1	0	Optimal	0.92	7	0.00	0.00
instance n=50 231.alb	1	0	Optimal	0.54	7	0.00	0.00
instance n=50 232.alb	1	0	Optimal	0.62	7	0.00	0.00
instance n=50 233.alb	1	0	Optimal	0.38	6	0.00	0.00
instance n=50 234.alb	1	0	Optimal	1.46	8	0.00	0.00
instance n=50 235.alb	1	0	Optimal	0.88	7	0.00	0.00
instance n=50 236.alb	1	0	Optimal	1.04	7	0.00	0.00
instance n=50 237.alb	1	0	Optimal	1.20	8	0.00	0.00
instance n=50 238.alb	1	0	Optimal	0.91	7	0.00	0.00
instance n=50 239.alb	1	0	Optimal	0.56	7	0.00	0.00
instance n=50 24.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 240.alb	1	0	Optimal	0.66	7	0.00	0.00
instance n=50 241.alb	1	0	Optimal	3.00	7	0.00	0.00
instance n=50 242.alb	1	0	Optimal	0.58	8	0.00	0.00
instance n=50 243.alb	1	0	Optimal	1.77	7	0.00	0.00
instance n=50 244.alb	1	0	Optimal	0.39	7	0.00	0.00
instance n=50 245.alb	1	0	Optimal	1.08	7	0.00	0.00
instance n=50 246.alb	1	0	Optimal	1.37	8	0.00	0.00
instance n=50 247.alb	1	0	Optimal	0.62	7	0.00	0.00
instance n=50 248.alb	1	0	Optimal	0.71	7	0.00	0.00
instance n=50 249.alb	1	0	Optimal	0.73	7	0.00	0.00
instance n=50 25.alb	1	0	Solution	30.07	6	0.00	0.00
instance n=50 250.alb	1	0	Optimal	0.82	7	0.00	0.00
instance n=50 251.alb	1	0	Optimal	4.64	27	0.00	0.00
instance n=50 252.alb	1	0	Optimal	4.19	32	0.00	0.00
instance n=50 253.alb	1	0	Optimal	7.88	28	0.00	0.00
instance n=50 254.alb	1	0	Optimal	11.32	30	0.00	0.00
instance n=50 255.alb	1	0	Optimal	4.35	29	0.00	0.00
instance n=50 256.alb	1	0	Optimal	25.77	30	0.00	0.00
instance n=50 257.alb	1	0	Optimal	7.59	33	0.00	0.00
instance n=50 258.alb	1	0	Optimal	6.89	28	0.00	0.00
instance n=50 259.alb	1	0	Optimal	4.14	31	0.00	0.00
instance n=50 26.alb	1	0	Solution	30.04	27	0.00	0.00
instance n=50 260.alb	1	0	Optimal	2.99	29	0.00	0.00
instance n=50 261.alb	1	0	Optimal	1.98	28	0.00	0.00
instance n=50 262.alb	1	0	Optimal	1.69	31	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 263.alb	1	0	Optimal	2.75	29	0.00	0.00
instance n=50 264.alb	1	0	Optimal	12.04	27	0.00	0.00
instance n=50 265.alb	1	0	Optimal	2.55	27	0.00	0.00
instance n=50 266.alb	1	0	Optimal	15.62	29	0.00	0.00
instance n=50 267.alb	1	0	Optimal	5.11	28	0.00	0.00
instance n=50 268.alb	1	0	Optimal	9.37	29	0.00	0.00
instance n=50 269.alb	1	0	Optimal	19.23	26	0.00	0.00
instance n=50 27.alb	1	0	Solution	30.06	30	0.00	0.00
instance n=50 270.alb	1	0	Optimal	9.09	28	0.00	0.00
instance n=50 271.alb	1	0	Optimal	4.22	31	0.00	0.00
instance n=50 272.alb	1	0	Optimal	1.99	27	0.00	0.00
instance n=50 273.alb	1	0	Optimal	16.36	27	0.00	0.00
instance n=50 274.alb	1	0	Optimal	2.11	29	0.00	0.00
instance n=50 275.alb	1	0	Optimal	5.10	27	0.00	0.00
instance n=50 276.alb	1	0	Optimal	0.67	12	0.00	0.00
instance n=50 277.alb	1	0	Optimal	0.63	13	0.00	0.00
instance n=50 278.alb	1	0	Optimal	1.56	12	0.00	0.00
instance n=50 279.alb	1	0	Optimal	6.73	11	0.00	0.00
instance n=50 28.alb	1	0	Solution	30.05	28	0.00	0.00
instance n=50 280.alb	1	0	Optimal	0.80	13	0.00	0.00
instance n=50 281.alb	1	0	Optimal	0.63	11	0.00	0.00
instance n=50 282.alb	1	0	Optimal	5.70	12	0.00	0.00
instance n=50 283.alb	1	0	Optimal	1.74	12	0.00	0.00
instance n=50 284.alb	1	0	Optimal	1.73	11	0.00	0.00
instance n=50 285.alb	1	0	Optimal	0.93	13	0.00	0.00
instance n=50 286.alb	1	0	Optimal	1.43	11	0.00	0.00
instance n=50 287.alb	1	0	Optimal	2.51	12	0.00	0.00
instance n=50 288.alb	1	0	Optimal	0.98	10	0.00	0.00
instance n=50 289.alb	1	0	Optimal	1.34	11	0.00	0.00
instance n=50 29.alb	1	0	Solution	30.07	29	0.00	0.00
instance n=50 290.alb	1	0	Optimal	1.61	14	0.00	0.00
instance n=50 291.alb	1	0	Optimal	1.26	12	0.00	0.00
instance n=50 292.alb	1	0	Optimal	1.52	13	0.00	0.00
instance n=50 293.alb	1	0	Optimal	0.92	12	0.00	0.00
instance n=50 294.alb	1	0	Optimal	1.20	13	0.00	0.00
instance n=50 295.alb	1	0	Optimal	9.01	16	0.00	0.00
instance n=50 296.alb	1	0	Solution	30.06	13	0.00	0.00
instance n=50 297.alb	1	0	Optimal	4.57	13	0.00	0.00
instance n=50 298.alb	1	0	Optimal	1.05	11	0.00	0.00
instance n=50 299.alb	1	0	Optimal	1.79	12	0.00	0.00
instance n=50 3.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 30.alb	1	0	Solution	30.06	27	0.00	0.00
instance n=50 300.alb	1	0	Optimal	0.71	12	0.00	0.00
instance n=50 301.alb	1	0	Solution	30.05	6	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 302.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 303.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 304.alb	1	0	Solution	30.04	7	0.00	0.00
instance n=50 305.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 306.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 307.alb	1	0	Solution	30.07	7	0.00	0.00
instance n=50 308.alb	1	0	Solution	30.07	8	0.00	0.00
instance n=50 309.alb	1	0	Solution	30.06	29	0.00	0.00
instance n=50 31.alb	1	0	Solution	30.05	28	0.00	0.00
instance n=50 310.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 311.alb	1	0	Solution	30.04	8	0.00	0.00
instance n=50 312.alb	1	0	Solution	30.05	6	0.00	0.00
instance n=50 313.alb	1	0	Solution	30.05	8	0.00	0.00
instance n=50 314.alb	1	0	Solution	30.06	22	0.00	0.00
instance n=50 315.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 316.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 317.alb	1	0	Solution	30.05	6	0.00	0.00
instance n=50 318.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 319.alb	1	0	Solution	30.05	7	0.00	0.00
instance n=50 32.alb	1	0	Solution	30.06	26	0.00	0.00
instance n=50 320.alb	1	0	Solution	30.06	8	0.00	0.00
instance n=50 321.alb	1	0	Solution	30.06	6	0.00	0.00
instance n=50 322.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 323.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 324.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 325.alb	1	0	Solution	30.06	7	0.00	0.00
instance n=50 326.alb	1	0	Solution	30.06	33	0.00	0.00
instance n=50 327.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 328.alb	1	0	Solution	30.06	32	0.00	0.00
instance n=50 329.alb	1	0	Solution	30.06	25	0.00	0.00
instance n=50 33.alb	1	0	Solution	30.07	25	0.00	0.00
instance n=50 330.alb	1	0	Solution	30.06	30	0.00	0.00
instance n=50 331.alb	1	0	Solution	30.06	40	0.00	0.00
instance n=50 332.alb	1	0	Solution	30.07	25	0.00	0.00
instance n=50 333.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 334.alb	1	0	Solution	30.05	29	0.00	0.00
instance n=50 335.alb	1	0	Solution	30.05	27	0.00	0.00
instance n=50 336.alb	1	0	Solution	30.06	26	0.00	0.00
instance n=50 337.alb	1	0	Solution	30.06	26	0.00	0.00
instance n=50 338.alb	1	0	Solution	30.06	36	0.00	0.00
instance n=50 339.alb	1	0	Solution	30.06	29	0.00	0.00
instance n=50 34.alb	1	0	Solution	30.06	30	0.00	0.00
instance n=50 340.alb	1	0	Solution	30.06	32	0.00	0.00
instance n=50 341.alb	1	0	Solution	30.06	27	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 342.alb	1	0	Solution	30.06	29	0.00	0.00
instance n=50 343.alb	1	0	Solution	30.06	28	0.00	0.00
instance n=50 344.alb	1	0	Solution	30.05	30	0.00	0.00
instance n=50 345.alb	1	0	Solution	30.05	29	0.00	0.00
instance n=50 346.alb	1	0	Solution	30.06	27	0.00	0.00
instance n=50 347.alb	1	0	Solution	30.06	31	0.00	0.00
instance n=50 348.alb	1	0	Solution	30.06	30	0.00	0.00
instance n=50 349.alb	1	0	Solution	30.06	29	0.00	0.00
instance n=50 35.alb	1	0	Solution	30.08	32	0.00	0.00
instance n=50 350.alb	1	0	Solution	30.07	32	0.00	0.00
instance n=50 351.alb	1	0	Solution	30.07	12	0.00	0.00
instance n=50 352.alb	1	0	Solution	30.06	10	0.00	0.00
instance n=50 353.alb	1	0	Solution	30.06	13	0.00	0.00
instance n=50 354.alb	1	0	Solution	30.06	14	0.00	0.00
instance n=50 355.alb	1	0	Solution	30.06	11	0.00	0.00
instance n=50 356.alb	1	0	Solution	30.04	15	0.00	0.00
instance n=50 357.alb	1	0	Solution	30.07	12	0.00	0.00
instance n=50 358.alb	1	0	Solution	30.05	11	0.00	0.00
instance n=50 359.alb	1	0	Solution	30.10	10	0.00	0.00
instance n=50 36.alb	1	0	Solution	30.06	31	0.00	0.00
instance n=50 360.alb	1	0	Solution	30.06	12	0.00	0.00
instance n=50 361.alb	1	0	Solution	30.07	11	0.00	0.00
instance n=50 362.alb	1	0	Solution	120.07	10	0.00	0.00
instance n=50 363.alb	1	0	Solution	120.07	12	0.00	0.00
instance n=50 364.alb	1	0	Solution	120.07	13	0.00	0.00
instance n=50 365.alb	1	0	Solution	120.07	11	0.00	0.00
instance n=50 366.alb	1	0	Solution	120.06	13	0.00	0.00
instance n=50 367.alb	1	0	Solution	120.07	12	0.00	0.00
instance n=50 368.alb	1	0	Solution	120.07	12	0.00	0.00
instance n=50 369.alb	1	0	Solution	120.05	12	0.00	0.00
instance n=50 37.alb	1	0	Solution	120.05	32	0.00	0.00
instance n=50 370.alb	1	0	Solution	120.05	12	0.00	0.00
instance n=50 371.alb	1	0	Solution	120.06	12	0.00	0.00
instance n=50 372.alb	1	0	Solution	120.07	10	0.00	0.00
instance n=50 373.alb	1	0	Solution	120.07	12	0.00	0.00
instance n=50 374.alb	1	0	Solution	120.06	11	0.00	0.00
instance n=50 375.alb	1	0	Solution	120.07	13	0.00	0.00
instance n=50 376.alb	1	0	Optimal	1.22	7	0.00	0.00
instance n=50 377.alb	1	0	Optimal	2.61	7	0.00	0.00
instance n=50 378.alb	1	0	Optimal	1.84	8	0.00	0.00
instance n=50 379.alb	1	0	Optimal	1.96	7	0.00	0.00
instance n=50 38.alb	1	0	Solution	120.07	31	0.00	0.00
instance n=50 380.alb	1	0	Optimal	1.98	7	0.00	0.00
instance n=50 381.alb	1	0	Optimal	2.21	8	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 382.alb	1	0	Optimal	0.48	6	0.00	0.00
instance n=50 383.alb	1	0	Optimal	7.68	7	0.00	0.00
instance n=50 384.alb	1	0	Optimal	2.05	8	0.00	0.00
instance n=50 385.alb	1	0	Optimal	1.28	7	0.00	0.00
instance n=50 386.alb	1	0	Optimal	1.82	7	0.00	0.00
instance n=50 387.alb	1	0	Optimal	7.76	8	0.00	0.00
instance n=50 388.alb	1	0	Optimal	1.37	7	0.00	0.00
instance n=50 389.alb	1	0	Optimal	0.56	8	0.00	0.00
instance n=50 39.alb	1	0	Solution	120.07	29	0.00	0.00
instance n=50 390.alb	1	0	Optimal	1.86	7	0.00	0.00
instance n=50 391.alb	1	0	Optimal	0.49	7	0.00	0.00
instance n=50 392.alb	1	0	Optimal	5.86	8	0.00	0.00
instance n=50 393.alb	1	0	Optimal	1.16	7	0.00	0.00
instance n=50 394.alb	1	0	Optimal	5.73	8	0.00	0.00
instance n=50 395.alb	1	0	Optimal	3.19	7	0.00	0.00
instance n=50 396.alb	1	0	Optimal	7.69	8	0.00	0.00
instance n=50 397.alb	1	0	Optimal	0.47	7	0.00	0.00
instance n=50 398.alb	1	0	Optimal	0.98	6	0.00	0.00
instance n=50 399.alb	1	0	Optimal	1.83	7	0.00	0.00
instance n=50 4.alb	1	0	Solution	120.07	7	0.00	0.00
instance n=50 40.alb	1	0	Solution	120.06	27	0.00	0.00
instance n=50 400.alb	1	0	Optimal	10.57	8	0.00	0.00
instance n=50 401.alb	1	0	Solution	120.07	28	0.00	0.00
instance n=50 402.alb	1	0	Optimal	9.44	27	0.00	0.00
instance n=50 403.alb	1	0	Optimal	9.93	34	0.00	0.00
instance n=50 404.alb	1	0	Optimal	3.16	31	0.00	0.00
instance n=50 405.alb	1	0	Optimal	3.56	27	0.00	0.00
instance n=50 406.alb	1	0	Optimal	14.55	32	0.00	0.00
instance n=50 407.alb	1	0	Optimal	6.85	29	0.00	0.00
instance n=50 408.alb	1	0	Optimal	79.30	26	0.00	0.00
instance n=50 409.alb	1	0	Optimal	15.82	33	0.00	0.00
instance n=50 41.alb	1	0	Solution	120.05	26	0.00	0.00
instance n=50 410.alb	1	0	Optimal	1.95	28	0.00	0.00
instance n=50 411.alb	1	0	Optimal	2.10	29	0.00	0.00
instance n=50 412.alb	1	0	Optimal	3.93	26	0.00	0.00
instance n=50 413.alb	1	0	Optimal	24.23	30	0.00	0.00
instance n=50 414.alb	1	0	Optimal	73.41	27	0.00	0.00
instance n=50 415.alb	1	0	Optimal	6.61	28	0.00	0.00
instance n=50 416.alb	1	0	Optimal	3.60	27	0.00	0.00
instance n=50 417.alb	1	0	Optimal	106.17	30	0.00	0.00
instance n=50 418.alb	1	0	Optimal	5.43	27	0.00	0.00
instance n=50 419.alb	1	0	Optimal	21.85	33	0.00	0.00
instance n=50 42.alb	1	0	Solution	120.05	24	0.00	0.00
instance n=50 420.alb	1	0	Optimal	36.05	28	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 421.alb	1	0	Optimal	4.65	34	0.00	0.00
instance n=50 422.alb	1	0	Optimal	17.60	29	0.00	0.00
instance n=50 423.alb	1	0	Optimal	5.98	29	0.00	0.00
instance n=50 424.alb	1	0	Optimal	2.65	27	0.00	0.00
instance n=50 425.alb	1	0	Optimal	47.23	34	0.00	0.00
instance n=50 426.alb	1	0	Optimal	2.18	11	0.00	0.00
instance n=50 427.alb	1	0	Optimal	1.90	12	0.00	0.00
instance n=50 428.alb	1	0	Optimal	6.82	13	0.00	0.00
instance n=50 429.alb	1	0	Optimal	2.93	11	0.00	0.00
instance n=50 43.alb	1	0	Solution	120.06	25	0.00	0.00
instance n=50 430.alb	1	0	Optimal	1.26	14	0.00	0.00
instance n=50 431.alb	1	0	Optimal	2.23	11	0.00	0.00
instance n=50 432.alb	1	0	Optimal	0.86	12	0.00	0.00
instance n=50 433.alb	1	0	Optimal	26.45	12	0.00	0.00
instance n=50 434.alb	1	0	Optimal	1.27	11	0.00	0.00
instance n=50 435.alb	1	0	Optimal	1.39	11	0.00	0.00
instance n=50 436.alb	1	0	Optimal	33.69	11	0.00	0.00
instance n=50 437.alb	1	0	Optimal	3.81	12	0.00	0.00
instance n=50 438.alb	1	0	Optimal	4.85	10	0.00	0.00
instance n=50 439.alb	1	0	Optimal	2.17	12	0.00	0.00
instance n=50 44.alb	1	0	Solution	120.06	25	0.00	0.00
instance n=50 440.alb	1	0	Optimal	4.12	13	0.00	0.00
instance n=50 441.alb	1	0	Optimal	49.03	11	0.00	0.00
instance n=50 442.alb	1	0	Optimal	1.46	12	0.00	0.00
instance n=50 443.alb	1	0	Optimal	0.66	11	0.00	0.00
instance n=50 444.alb	1	0	Optimal	1.60	12	0.00	0.00
instance n=50 445.alb	1	0	Optimal	3.15	12	0.00	0.00
instance n=50 446.alb	1	0	Optimal	0.89	12	0.00	0.00
instance n=50 447.alb	1	0	Optimal	3.76	13	0.00	0.00
instance n=50 448.alb	1	0	Optimal	1.55	12	0.00	0.00
instance n=50 449.alb	1	0	Optimal	0.76	11	0.00	0.00
instance n=50 45.alb	1	0	Solution	120.07	25	0.00	0.00
instance n=50 450.alb	1	0	Optimal	1.12	11	0.00	0.00
instance n=50 451.alb	1	0	Optimal	0.36	8	0.00	0.00
instance n=50 452.alb	1	0	Optimal	0.37	8	0.00	0.00
instance n=50 453.alb	1	0	Optimal	0.35	7	0.00	0.00
instance n=50 454.alb	1	0	Optimal	0.36	8	0.00	0.00
instance n=50 455.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=50 456.alb	1	0	Optimal	0.35	8	0.00	0.00
instance n=50 457.alb	1	0	Optimal	0.36	8	0.00	0.00
instance n=50 458.alb	1	0	Optimal	0.35	7	0.00	0.00
instance n=50 459.alb	1	0	Optimal	0.34	7	0.00	0.00
instance n=50 46.alb	1	0	Solution	120.07	29	0.00	0.00
instance n=50 460.alb	1	0	Optimal	0.34	7	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 461.alb	1	0	Optimal	0.34	6	0.00	0.00
instance n=50 462.alb	1	0	Optimal	0.36	7	0.00	0.00
instance n=50 463.alb	1	0	Optimal	0.36	8	0.00	0.00
instance n=50 464.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=50 465.alb	1	0	Optimal	0.36	8	0.00	0.00
instance n=50 466.alb	1	0	Optimal	0.34	7	0.00	0.00
instance n=50 467.alb	1	0	Optimal	0.38	9	0.00	0.00
instance n=50 468.alb	1	0	Optimal	0.33	7	0.00	0.00
instance n=50 469.alb	1	0	Optimal	0.35	8	0.00	0.00
instance n=50 47.alb	1	0	Solution	120.06	45	0.00	0.00
instance n=50 470.alb	1	0	Optimal	0.36	8	0.00	0.00
instance n=50 471.alb	1	0	Optimal	0.34	7	0.00	0.00
instance n=50 472.alb	1	0	Optimal	0.38	8	0.00	0.00
instance n=50 473.alb	1	0	Optimal	0.35	7	0.00	0.00
instance n=50 474.alb	1	0	Optimal	0.35	7	0.00	0.00
instance n=50 475.alb	1	0	Optimal	0.35	6	0.00	0.00
instance n=50 476.alb	1	0	Optimal	0.38	28	0.00	0.00
instance n=50 477.alb	1	0	Optimal	0.45	29	0.00	0.00
instance n=50 478.alb	1	0	Optimal	0.42	32	0.00	0.00
instance n=50 479.alb	1	0	Optimal	0.41	28	0.00	0.00
instance n=50 48.alb	1	0	Solution	120.06	27	0.00	0.00
instance n=50 480.alb	1	0	Optimal	0.34	34	0.00	0.00
instance n=50 481.alb	1	0	Optimal	0.36	28	0.00	0.00
instance n=50 482.alb	1	0	Optimal	0.38	27	0.00	0.00
instance n=50 483.alb	1	0	Optimal	0.41	30	0.00	0.00
instance n=50 484.alb	1	0	Optimal	0.34	32	0.00	0.00
instance n=50 485.alb	1	0	Optimal	0.37	31	0.00	0.00
instance n=50 486.alb	1	0	Optimal	0.36	32	0.00	0.00
instance n=50 487.alb	1	0	Optimal	0.49	31	0.00	0.00
instance n=50 488.alb	1	0	Optimal	0.46	31	0.00	0.00
instance n=50 489.alb	1	0	Optimal	0.38	35	0.00	0.00
instance n=50 49.alb	1	0	Solution	120.07	25	0.00	0.00
instance n=50 490.alb	1	0	Optimal	0.39	29	0.00	0.00
instance n=50 491.alb	1	0	Optimal	0.49	35	0.00	0.00
instance n=50 492.alb	1	0	Optimal	0.54	29	0.00	0.00
instance n=50 493.alb	1	0	Optimal	0.45	30	0.00	0.00
instance n=50 494.alb	1	0	Optimal	0.41	32	0.00	0.00
instance n=50 495.alb	1	0	Optimal	0.36	34	0.00	0.00
instance n=50 496.alb	1	0	Optimal	0.42	29	0.00	0.00
instance n=50 497.alb	1	0	Optimal	0.41	30	0.00	0.00
instance n=50 498.alb	1	0	Optimal	0.36	30	0.00	0.00
instance n=50 499.alb	1	0	Optimal	0.36	33	0.00	0.00
instance n=50 5.alb	1	0	Solution	120.05	7	0.00	0.00
instance n=50 50.alb	1	0	Solution	120.07	27	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 500.alb	1	0	Optimal	0.43	34	0.00	0.00
instance n=50 501.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=50 502.alb	1	0	Optimal	0.35	10	0.00	0.00
instance n=50 503.alb	1	0	Optimal	0.36	13	0.00	0.00
instance n=50 504.alb	1	0	Optimal	0.37	11	0.00	0.00
instance n=50 505.alb	1	0	Optimal	0.37	12	0.00	0.00
instance n=50 506.alb	1	0	Optimal	0.37	11	0.00	0.00
instance n=50 507.alb	1	0	Optimal	0.37	13	0.00	0.00
instance n=50 508.alb	1	0	Optimal	0.36	14	0.00	0.00
instance n=50 509.alb	1	0	Optimal	0.39	13	0.00	0.00
instance n=50 51.alb	1	0	Solution	120.07	12	0.00	0.00
instance n=50 510.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=50 511.alb	1	0	Optimal	0.36	13	0.00	0.00
instance n=50 512.alb	1	0	Optimal	0.39	13	0.00	0.00
instance n=50 513.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=50 514.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=50 515.alb	1	0	Optimal	0.37	11	0.00	0.00
instance n=50 516.alb	1	0	Optimal	0.37	13	0.00	0.00
instance n=50 517.alb	1	0	Optimal	0.41	14	0.00	0.00
instance n=50 518.alb	1	0	Optimal	0.36	11	0.00	0.00
instance n=50 519.alb	1	0	Optimal	0.39	12	0.00	0.00
instance n=50 52.alb	1	0	Solution	120.06	11	0.00	0.00
instance n=50 520.alb	1	0	Optimal	0.37	11	0.00	0.00
instance n=50 521.alb	1	0	Optimal	0.36	10	0.00	0.00
instance n=50 522.alb	1	0	Optimal	0.39	11	0.00	0.00
instance n=50 523.alb	1	0	Optimal	0.37	11	0.00	0.00
instance n=50 524.alb	1	0	Optimal	0.38	14	0.00	0.00
instance n=50 525.alb	1	0	Optimal	0.37	11	0.00	0.00
instance n=50 53.alb	1	0	Solution	120.07	13	0.00	0.00
instance n=50 54.alb	1	0	Solution	120.07	11	0.00	0.00
instance n=50 55.alb	1	0	Solution	120.06	13	0.00	0.00
instance n=50 56.alb	1	0	Solution	120.07	11	0.00	0.00
instance n=50 57.alb	1	0	Solution	120.06	13	0.00	0.00
instance n=50 58.alb	1	0	Solution	120.06	11	0.00	0.00
instance n=50 59.alb	1	0	Solution	120.06	11	0.00	0.00
instance n=50 6.alb	1	0	Solution	120.06	6	0.00	0.00
instance n=50 60.alb	1	0	Solution	120.07	12	0.00	0.00
instance n=50 61.alb	1	0	Solution	120.07	13	0.00	0.00
instance n=50 62.alb	1	0	Solution	120.07	13	0.00	0.00
instance n=50 63.alb	1	0	Solution	120.06	12	0.00	0.00
instance n=50 64.alb	1	0	Solution	120.07	13	0.00	0.00
instance n=50 65.alb	1	0	Solution	120.07	12	0.00	0.00
instance n=50 66.alb	1	0	Solution	120.06	12	0.00	0.00
instance n=50 67.alb	1	0	Solution	120.07	12	0.00	0.00

Table 6.4: Results for SALBP-1 Problems (Chuffed) (1575 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 68.alb	1	0	Solution	120.06	12	0.00	0.00
instance n=50 69.alb	1	0	Solution	120.06	12	0.00	0.00
instance n=50 7.alb	1	0	Solution	120.06	7	0.00	0.00
instance n=50 70.alb	1	0	Solution	120.07	10	0.00	0.00
instance n=50 71.alb	1	0	Solution	120.07	13	0.00	0.00
instance n=50 72.alb	1	0	Solution	120.06	11	0.00	0.00
instance n=50 73.alb	1	0	Solution	120.06	11	0.00	0.00
instance n=50 74.alb	1	0	Solution	120.05	12	0.00	0.00
instance n=50 75.alb	1	0	Solution	120.05	11	0.00	0.00
instance n=50 76.alb	1	0	Optimal	24.90	7	0.00	0.00
instance n=50 77.alb	1	0	Optimal	1.47	7	0.00	0.00
instance n=50 78.alb	1	0	Optimal	24.48	7	0.00	0.00
instance n=50 79.alb	1	0	Optimal	2.48	8	0.00	0.00
instance n=50 8.alb	1	0	Solution	120.06	7	0.00	0.00
instance n=50 80.alb	1	0	Optimal	0.70	7	0.00	0.00
instance n=50 81.alb	1	0	Optimal	5.16	7	0.00	0.00
instance n=50 82.alb	1	0	Optimal	3.40	6	0.00	0.00
instance n=50 83.alb	1	0	Optimal	2.15	8	0.00	0.00
instance n=50 84.alb	1	0	Optimal	0.68	7	0.00	0.00
instance n=50 85.alb	1	0	Optimal	23.25	8	0.00	0.00
instance n=50 86.alb	1	0	Optimal	4.82	7	0.00	0.00
instance n=50 87.alb	1	0	Optimal	1.71	8	0.00	0.00
instance n=50 88.alb	1	0	Solution	120.06	8	0.00	0.00
instance n=50 89.alb	1	0	Optimal	1.02	7	0.00	0.00
instance n=50 9.alb	1	0	Solution	120.06	9	0.00	0.00
instance n=50 90.alb	1	0	Optimal	0.94	7	0.00	0.00
instance n=50 91.alb	1	0	Optimal	2.99	7	0.00	0.00
instance n=50 92.alb	1	0	Optimal	1.38	7	0.00	0.00
instance n=50 93.alb	1	0	Optimal	1.78	7	0.00	0.00
instance n=50 94.alb	1	0	Optimal	0.64	7	0.00	0.00
instance n=50 95.alb	1	0	Optimal	1.01	7	0.00	0.00
instance n=50 96.alb	1	0	Optimal	0.69	7	0.00	0.00
instance n=50 97.alb	1	0	Optimal	0.56	7	0.00	0.00
instance n=50 98.alb	1	0	Optimal	14.86	8	0.00	0.00
instance n=50 99.alb	1	0	Optimal	1.78	7	0.00	0.00

6.5 Alternative Model

6.5.1 CPO

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 1.alb	1	1	Solution	30.19	136	135.00	0.74
instance n=1000 10.alb	1	1	Solution	30.08	141	140.00	0.71
instance n=1000 100.alb	1	1	Solution	30.05	138	137.00	0.72
instance n=1000 101.alb	1	1	Solution	30.10	552	505.00	8.51
instance n=1000 102.alb	1	1	Solution	30.05	551	503.00	8.71
instance n=1000 103.alb	1	1	Solution	30.13	557	503.00	9.69
instance n=1000 104.alb	1	1	Solution	30.08	544	504.00	7.35
instance n=1000 105.alb	1	1	Solution	30.05	540	499.00	7.59
instance n=1000 106.alb	1	1	Solution	30.08	546	499.00	8.61
instance n=1000 107.alb	1	1	Solution	30.06	533	496.00	6.94
instance n=1000 108.alb	1	1	Solution	30.13	540	498.00	7.78
instance n=1000 109.alb	1	1	Solution	30.03	546	500.00	8.42
instance n=1000 11.alb	1	1	Solution	30.08	135	134.00	0.74
instance n=1000 110.alb	1	1	Solution	30.09	553	501.00	9.40
instance n=1000 111.alb	1	1	Solution	30.04	539	500.00	7.24
instance n=1000 112.alb	1	1	Solution	30.11	545	499.00	8.44
instance n=1000 113.alb	1	1	Solution	30.12	539	495.00	8.16
instance n=1000 114.alb	1	1	Solution	30.10	544	502.00	7.72
instance n=1000 115.alb	1	1	Solution	30.07	537	498.00	7.26
instance n=1000 116.alb	1	1	Solution	30.10	536	496.00	7.46
instance n=1000 117.alb	1	1	Solution	30.06	546	500.00	8.42
instance n=1000 118.alb	1	1	Solution	30.05	557	509.00	8.62
instance n=1000 119.alb	1	1	Solution	30.05	527	496.00	5.88
instance n=1000 12.alb	1	1	Solution	30.04	134	134.00	0.00
instance n=1000 120.alb	1	1	Solution	30.13	546	502.00	8.06
instance n=1000 121.alb	1	1	Solution	30.05	537	496.00	7.64
instance n=1000 122.alb	1	1	Solution	30.08	527	493.00	6.45
instance n=1000 123.alb	1	1	Solution	30.09	549	504.00	8.20
instance n=1000 124.alb	1	1	Solution	30.05	535	498.00	6.92
instance n=1000 125.alb	1	1	Solution	30.05	538	499.00	7.25
instance n=1000 126.alb	1	1	Solution	30.04	231	228.00	1.30
instance n=1000 127.alb	1	1	Solution	30.08	223	221.00	0.90
instance n=1000 128.alb	1	1	Solution	30.08	225	222.00	1.33
instance n=1000 129.alb	1	1	Solution	30.04	225	223.00	0.89
instance n=1000 13.alb	1	1	Solution	30.09	132	131.00	0.76
instance n=1000 130.alb	1	1	Solution	30.07	224	221.00	1.34
instance n=1000 131.alb	1	1	Solution	30.09	222	220.00	0.90
instance n=1000 132.alb	1	1	Solution	30.09	217	214.00	1.38
instance n=1000 133.alb	1	1	Solution	30.06	229	226.00	1.31
instance n=1000 134.alb	1	1	Solution	30.03	218	215.00	1.38
instance n=1000 135.alb	1	1	Solution	30.09	228	225.00	1.32
instance n=1000 136.alb	1	1	Solution	30.08	230	228.00	0.87
instance n=1000 137.alb	1	1	Solution	30.04	215	213.00	0.93
instance n=1000 138.alb	1	1	Solution	30.05	223	221.00	0.90

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 139.alb	1	1	Solution	30.08	226	224.00	0.88
instance n=1000 14.alb	1	1	Solution	30.06	137	136.00	0.73
instance n=1000 140.alb	1	1	Solution	30.06	228	226.00	0.88
instance n=1000 141.alb	1	1	Solution	30.09	217	215.00	0.92
instance n=1000 142.alb	1	1	Solution	30.11	222	220.00	0.90
instance n=1000 143.alb	1	1	Solution	30.07	215	213.00	0.93
instance n=1000 144.alb	1	1	Solution	30.10	219	217.00	0.91
instance n=1000 145.alb	1	1	Solution	30.09	222	220.00	0.90
instance n=1000 146.alb	1	1	Solution	30.05	222	219.00	1.35
instance n=1000 147.alb	1	1	Solution	30.07	232	229.00	1.29
instance n=1000 148.alb	1	1	Solution	30.09	221	219.00	0.90
instance n=1000 149.alb	1	1	Solution	30.08	239	237.00	0.84
instance n=1000 15.alb	1	1	Solution	30.06	136	136.00	0.00
instance n=1000 150.alb	1	1	Solution	30.05	224	222.00	0.89
instance n=1000 151.alb	1	1	Solution	30.08	139	138.00	0.72
instance n=1000 152.alb	1	1	Solution	30.07	137	136.00	0.73
instance n=1000 153.alb	1	1	Solution	30.06	138	137.00	0.72
instance n=1000 154.alb	1	1	Solution	30.07	141	140.00	0.71
instance n=1000 155.alb	1	1	Solution	30.05	140	139.00	0.71
instance n=1000 156.alb	1	1	Solution	30.08	142	141.00	0.70
instance n=1000 157.alb	1	1	Solution	30.06	141	140.00	0.71
instance n=1000 158.alb	1	1	Solution	30.08	136	136.00	0.00
instance n=1000 159.alb	1	1	Solution	30.06	139	138.00	0.72
instance n=1000 16.alb	1	1	Solution	30.07	138	137.00	0.72
instance n=1000 160.alb	1	1	Solution	30.06	139	138.00	0.72
instance n=1000 161.alb	1	1	Solution	30.07	133	133.00	0.00
instance n=1000 162.alb	1	1	Solution	30.09	136	136.00	0.00
instance n=1000 163.alb	1	1	Solution	30.07	140	139.00	0.71
instance n=1000 164.alb	1	1	Solution	30.04	142	141.00	0.70
instance n=1000 165.alb	1	1	Solution	30.03	136	135.00	0.74
instance n=1000 166.alb	1	1	Solution	30.05	140	139.00	0.71
instance n=1000 167.alb	1	1	Solution	30.08	140	139.00	0.71
instance n=1000 168.alb	1	1	Solution	30.04	139	138.00	0.72
instance n=1000 169.alb	1	1	Solution	30.03	135	134.00	0.74
instance n=1000 17.alb	1	1	Solution	30.06	135	135.00	0.00
instance n=1000 170.alb	1	1	Solution	30.06	135	134.00	0.74
instance n=1000 171.alb	1	1	Solution	30.06	138	137.00	0.72
instance n=1000 172.alb	1	1	Solution	30.05	136	135.00	0.74
instance n=1000 173.alb	1	1	Solution	30.05	136	135.00	0.74
instance n=1000 174.alb	1	1	Solution	30.08	137	136.00	0.73
instance n=1000 175.alb	1	1	Solution	30.07	139	138.00	0.72
instance n=1000 176.alb	1	1	Solution	30.12	538	500.00	7.06
instance n=1000 177.alb	1	1	Solution	30.03	534	499.00	6.55
instance n=1000 178.alb	1	1	Solution	30.04	555	506.00	8.83

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 179.alb	1	1	Solution	30.06	547	505.00	7.68
instance n=1000 18.alb	1	1	Solution	30.06	134	134.00	0.00
instance n=1000 180.alb	1	1	Solution	30.10	556	503.00	9.53
instance n=1000 181.alb	1	1	Solution	30.10	552	505.00	8.51
instance n=1000 182.alb	1	1	Solution	30.11	546	502.00	8.06
instance n=1000 183.alb	1	1	Solution	30.10	543	500.00	7.92
instance n=1000 184.alb	1	1	Solution	30.08	547	502.00	8.23
instance n=1000 185.alb	1	1	Solution	30.04	547	503.00	8.04
instance n=1000 186.alb	1	1	Solution	30.10	540	500.00	7.41
instance n=1000 187.alb	1	1	Solution	30.08	556	505.00	9.17
instance n=1000 188.alb	1	1	Solution	30.09	538	498.00	7.43
instance n=1000 189.alb	1	1	Solution	30.10	540	498.00	7.78
instance n=1000 19.alb	1	1	Solution	30.06	137	137.00	0.00
instance n=1000 190.alb	1	1	Solution	30.06	547	501.00	8.41
instance n=1000 191.alb	1	1	Solution	30.05	543	501.00	7.73
instance n=1000 192.alb	1	1	Solution	30.06	544	501.00	7.90
instance n=1000 193.alb	1	1	Solution	30.10	546	503.00	7.88
instance n=1000 194.alb	1	1	Solution	30.08	542	502.00	7.38
instance n=1000 195.alb	1	1	Solution	30.04	554	502.00	9.39
instance n=1000 196.alb	1	1	Solution	30.08	547	500.00	8.59
instance n=1000 197.alb	1	1	Solution	30.03	525	496.00	5.52
instance n=1000 198.alb	1	1	Solution	30.09	549	503.00	8.38
instance n=1000 199.alb	1	1	Solution	30.04	527	495.00	6.07
instance n=1000 2.alb	1	1	Solution	30.07	138	137.00	0.72
instance n=1000 20.alb	1	1	Solution	30.06	138	138.00	0.00
instance n=1000 200.alb	1	1	Solution	30.09	534	498.00	6.74
instance n=1000 201.alb	1	1	Solution	30.09	231	229.00	0.87
instance n=1000 202.alb	1	1	Solution	30.07	228	225.00	1.32
instance n=1000 203.alb	1	1	Solution	30.06	232	229.00	1.29
instance n=1000 204.alb	1	1	Solution	30.05	231	228.00	1.30
instance n=1000 205.alb	1	1	Solution	30.05	231	229.00	0.87
instance n=1000 206.alb	1	1	Solution	30.08	231	229.00	0.87
instance n=1000 207.alb	1	1	Solution	30.05	232	230.00	0.86
instance n=1000 208.alb	1	1	Solution	30.06	232	229.00	1.29
instance n=1000 209.alb	1	1	Solution	30.04	231	228.00	1.30
instance n=1000 21.alb	1	1	Solution	30.06	139	138.00	0.72
instance n=1000 210.alb	1	1	Solution	30.05	226	224.00	0.88
instance n=1000 211.alb	1	1	Solution	30.06	221	219.00	0.90
instance n=1000 212.alb	1	1	Solution	30.05	219	217.00	0.91
instance n=1000 213.alb	1	1	Solution	30.05	236	233.00	1.27
instance n=1000 214.alb	1	1	Solution	30.11	227	225.00	0.88
instance n=1000 215.alb	1	1	Solution	30.08	225	223.00	0.89
instance n=1000 216.alb	1	1	Solution	30.03	223	221.00	0.90
instance n=1000 217.alb	1	1	Solution	30.10	228	225.00	1.32

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 218.alb	1	1	Solution	30.08	221	219.00	0.90
instance n=1000 219.alb	1	1	Solution	30.10	235	232.00	1.28
instance n=1000 22.alb	1	1	Solution	30.07	138	137.00	0.72
instance n=1000 220.alb	1	1	Solution	30.08	227	225.00	0.88
instance n=1000 221.alb	1	1	Solution	30.03	234	231.00	1.28
instance n=1000 222.alb	1	1	Solution	30.08	224	221.00	1.34
instance n=1000 223.alb	1	1	Solution	30.09	224	221.00	1.34
instance n=1000 224.alb	1	1	Solution	30.07	229	226.00	1.31
instance n=1000 225.alb	1	1	Solution	30.07	232	229.00	1.29
instance n=1000 226.alb	1	1	Solution	30.06	137	136.00	0.73
instance n=1000 227.alb	1	1	Solution	30.05	139	138.00	0.72
instance n=1000 228.alb	1	1	Solution	30.05	135	133.00	1.48
instance n=1000 229.alb	1	1	Solution	30.08	135	134.00	0.74
instance n=1000 23.alb	1	1	Solution	30.04	137	136.00	0.73
instance n=1000 230.alb	1	1	Solution	30.09	132	131.00	0.76
instance n=1000 231.alb	1	1	Solution	30.07	139	138.00	0.72
instance n=1000 232.alb	1	1	Solution	30.03	134	133.00	0.75
instance n=1000 233.alb	1	1	Solution	30.08	137	135.00	1.46
instance n=1000 234.alb	1	1	Solution	30.08	138	137.00	0.72
instance n=1000 235.alb	1	1	Solution	30.06	134	133.00	0.75
instance n=1000 236.alb	1	1	Solution	30.08	137	136.00	0.73
instance n=1000 237.alb	1	1	Solution	30.04	140	138.00	1.43
instance n=1000 238.alb	1	1	Solution	30.06	139	138.00	0.72
instance n=1000 239.alb	1	1	Solution	30.06	136	135.00	0.74
instance n=1000 24.alb	1	1	Solution	30.09	141	140.00	0.71
instance n=1000 240.alb	1	1	Solution	30.04	137	135.00	1.46
instance n=1000 241.alb	1	1	Solution	30.10	139	138.00	0.72
instance n=1000 242.alb	1	1	Solution	30.08	136	135.00	0.74
instance n=1000 243.alb	1	1	Solution	30.05	138	137.00	0.72
instance n=1000 244.alb	1	1	Solution	30.05	138	137.00	0.72
instance n=1000 245.alb	1	1	Solution	30.03	136	135.00	0.74
instance n=1000 246.alb	1	1	Solution	30.03	136	135.00	0.74
instance n=1000 247.alb	1	1	Solution	30.06	140	138.00	1.43
instance n=1000 248.alb	1	1	Solution	30.05	140	138.00	1.43
instance n=1000 249.alb	1	1	Solution	30.08	139	138.00	0.72
instance n=1000 25.alb	1	1	Solution	30.06	136	136.00	0.00
instance n=1000 250.alb	1	1	Solution	30.09	141	140.00	0.71
instance n=1000 251.alb	1	1	Solution	30.10	561	502.00	10.52
instance n=1000 252.alb	1	1	Solution	30.08	563	501.00	11.01
instance n=1000 253.alb	1	1	Solution	30.10	561	502.00	10.52
instance n=1000 254.alb	1	1	Solution	30.09	559	501.00	10.38
instance n=1000 255.alb	1	1	Solution	30.12	550	498.00	9.45
instance n=1000 256.alb	1	1	Solution	30.06	551	495.00	10.16
instance n=1000 257.alb	1	1	Solution	30.08	564	502.00	10.99

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 258.alb	1	1	Solution	30.07	557	497.00	10.77
instance n=1000 259.alb	1	1	Solution	30.07	547	496.00	9.32
instance n=1000 26.alb	1	1	Solution	30.07	541	502.00	7.21
instance n=1000 260.alb	1	1	Solution	30.09	549	495.00	9.84
instance n=1000 261.alb	1	1	Solution	30.07	558	501.00	10.22
instance n=1000 262.alb	1	1	Solution	30.14	540	495.00	8.33
instance n=1000 263.alb	1	1	Solution	30.04	558	499.00	10.57
instance n=1000 264.alb	1	1	Solution	30.04	556	499.00	10.25
instance n=1000 265.alb	1	1	Solution	30.06	574	506.00	11.85
instance n=1000 266.alb	1	1	Solution	30.17	556	500.00	10.07
instance n=1000 267.alb	1	1	Solution	30.03	565	506.00	10.44
instance n=1000 268.alb	1	1	Solution	30.06	547	497.00	9.14
instance n=1000 269.alb	1	1	Solution	30.08	553	500.00	9.58
instance n=1000 27.alb	1	1	Solution	30.13	542	502.00	7.38
instance n=1000 270.alb	1	1	Solution	30.08	581	508.00	12.56
instance n=1000 271.alb	1	1	Solution	30.11	546	497.00	8.97
instance n=1000 272.alb	1	1	Solution	30.08	562	502.00	10.68
instance n=1000 273.alb	1	1	Solution	30.09	561	500.00	10.87
instance n=1000 274.alb	1	1	Solution	30.05	555	496.00	10.63
instance n=1000 275.alb	1	1	Solution	30.06	568	504.00	11.27
instance n=1000 276.alb	1	1	Solution	30.08	220	217.00	1.36
instance n=1000 277.alb	1	1	Solution	30.05	229	225.00	1.75
instance n=1000 278.alb	1	1	Solution	30.06	224	220.00	1.79
instance n=1000 279.alb	1	1	Solution	30.15	219	215.00	1.83
instance n=1000 28.alb	1	1	Solution	30.11	531	497.00	6.40
instance n=1000 280.alb	1	1	Solution	30.14	229	226.00	1.31
instance n=1000 281.alb	1	1	Solution	30.08	223	219.00	1.79
instance n=1000 282.alb	1	1	Solution	30.06	218	214.00	1.83
instance n=1000 283.alb	1	1	Solution	30.09	228	224.00	1.75
instance n=1000 284.alb	1	1	Solution	30.06	220	217.00	1.36
instance n=1000 285.alb	1	1	Solution	30.05	225	221.00	1.78
instance n=1000 286.alb	1	1	Solution	30.11	225	221.00	1.78
instance n=1000 287.alb	1	1	Solution	30.13	227	224.00	1.32
instance n=1000 288.alb	1	1	Solution	30.13	223	219.00	1.79
instance n=1000 289.alb	1	1	Solution	30.06	224	220.00	1.79
instance n=1000 29.alb	1	1	Solution	30.10	530	498.00	6.04
instance n=1000 290.alb	1	1	Solution	30.11	226	222.00	1.77
instance n=1000 291.alb	1	1	Solution	30.13	228	225.00	1.32
instance n=1000 292.alb	1	1	Solution	30.09	230	226.00	1.74
instance n=1000 293.alb	1	1	Solution	30.05	228	225.00	1.32
instance n=1000 294.alb	1	1	Solution	30.06	234	230.00	1.71
instance n=1000 295.alb	1	1	Solution	30.09	231	227.00	1.73
instance n=1000 296.alb	1	1	Solution	30.16	211	208.00	1.42
instance n=1000 297.alb	1	1	Solution	30.05	220	217.00	1.36

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 298.alb	1	1	Solution	30.07	218	214.00	1.83
instance n=1000 299.alb	1	1	Solution	30.12	230	226.00	1.74
instance n=1000 3.alb	1	1	Solution	30.06	137	136.00	0.73
instance n=1000 30.alb	1	1	Solution	30.13	548	506.00	7.66
instance n=1000 300.alb	1	1	Solution	30.15	232	228.00	1.72
instance n=1000 301.alb	1	1	Solution	30.12	138	137.00	0.72
instance n=1000 302.alb	1	1	Solution	30.12	139	139.00	0.00
instance n=1000 303.alb	1	1	Solution	30.12	139	138.00	0.72
instance n=1000 304.alb	1	1	Solution	30.12	137	136.00	0.73
instance n=1000 305.alb	1	1	Solution	30.08	140	140.00	0.00
instance n=1000 306.alb	1	1	Solution	30.08	136	135.00	0.74
instance n=1000 307.alb	1	1	Solution	30.11	136	136.00	0.00
instance n=1000 308.alb	1	1	Solution	30.13	138	137.00	0.72
instance n=1000 309.alb	1	1	Solution	30.10	135	135.00	0.00
instance n=1000 31.alb	1	1	Solution	30.16	543	506.00	6.81
instance n=1000 310.alb	1	1	Solution	30.09	142	141.00	0.70
instance n=1000 311.alb	1	1	Solution	30.11	140	139.00	0.71
instance n=1000 312.alb	1	1	Solution	30.06	135	135.00	0.00
instance n=1000 313.alb	1	1	Solution	30.10	139	138.00	0.72
instance n=1000 314.alb	1	1	Solution	30.05	142	142.00	0.00
instance n=1000 315.alb	1	1	Solution	30.04	137	136.00	0.73
instance n=1000 316.alb	1	1	Solution	30.11	138	137.00	0.72
instance n=1000 317.alb	1	1	Solution	30.03	137	136.00	0.73
instance n=1000 318.alb	1	1	Solution	30.11	139	138.00	0.72
instance n=1000 319.alb	1	1	Solution	30.10	141	140.00	0.71
instance n=1000 32.alb	1	1	Solution	30.14	531	502.00	5.46
instance n=1000 320.alb	1	1	Solution	30.10	142	141.00	0.70
instance n=1000 321.alb	1	1	Solution	30.08	141	140.00	0.71
instance n=1000 322.alb	1	1	Solution	30.09	139	139.00	0.00
instance n=1000 323.alb	1	1	Solution	30.06	139	138.00	0.72
instance n=1000 324.alb	1	1	Solution	30.13	141	140.00	0.71
instance n=1000 325.alb	1	1	Solution	30.05	139	138.00	0.72
instance n=1000 326.alb	1	1	Solution	30.11	529	496.00	6.24
instance n=1000 327.alb	1	1	Solution	30.08	540	503.00	6.85
instance n=1000 328.alb	1	1	Solution	30.08	528	500.00	5.30
instance n=1000 329.alb	1	1	Solution	30.09	539	502.00	6.86
instance n=1000 33.alb	1	1	Solution	30.14	537	501.00	6.70
instance n=1000 330.alb	1	1	Solution	30.16	527	498.00	5.50
instance n=1000 331.alb	1	1	Solution	30.04	530	498.00	6.04
instance n=1000 332.alb	1	1	Solution	30.10	522	495.00	5.17
instance n=1000 333.alb	1	1	Solution	30.14	542	499.00	7.93
instance n=1000 334.alb	1	1	Solution	30.08	522	498.00	4.60
instance n=1000 335.alb	1	1	Solution	30.06	532	496.00	6.77
instance n=1000 336.alb	1	1	Solution	30.16	523	497.00	4.97

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 337.alb	1	1	Solution	30.06	539	501.00	7.05
instance n=1000 338.alb	1	1	Solution	30.07	535	502.00	6.17
instance n=1000 339.alb	1	1	Solution	30.13	540	500.00	7.41
instance n=1000 34.alb	1	1	Solution	30.06	555	507.00	8.65
instance n=1000 340.alb	1	1	Solution	30.16	551	505.00	8.35
instance n=1000 341.alb	1	1	Solution	30.07	543	503.00	7.37
instance n=1000 342.alb	1	1	Solution	30.11	535	500.00	6.54
instance n=1000 343.alb	1	1	Solution	30.14	541	500.00	7.58
instance n=1000 344.alb	1	1	Solution	30.04	533	500.00	6.19
instance n=1000 345.alb	1	1	Solution	30.16	540	502.00	7.04
instance n=1000 346.alb	1	1	Solution	30.05	531	501.00	5.65
instance n=1000 347.alb	1	1	Solution	30.03	538	498.00	7.43
instance n=1000 348.alb	1	1	Solution	30.17	557	506.00	9.16
instance n=1000 349.alb	1	1	Solution	30.11	542	503.00	7.20
instance n=1000 35.alb	1	1	Solution	30.09	531	501.00	5.65
instance n=1000 350.alb	1	1	Solution	30.15	525	496.00	5.52
instance n=1000 351.alb	1	1	Solution	30.07	230	227.00	1.30
instance n=1000 352.alb	1	1	Solution	30.05	229	227.00	0.87
instance n=1000 353.alb	1	1	Solution	30.15	219	217.00	0.91
instance n=1000 354.alb	1	1	Solution	30.07	224	222.00	0.89
instance n=1000 355.alb	1	1	Solution	30.13	222	220.00	0.90
instance n=1000 356.alb	1	1	Solution	30.14	228	226.00	0.88
instance n=1000 357.alb	1	1	Solution	30.10	215	213.00	0.93
instance n=1000 358.alb	1	1	Solution	30.10	221	219.00	0.90
instance n=1000 359.alb	1	1	Solution	30.09	224	222.00	0.89
instance n=1000 36.alb	1	1	Solution	30.09	529	497.00	6.05
instance n=1000 360.alb	1	1	Solution	30.14	232	229.00	1.29
instance n=1000 361.alb	1	1	Solution	30.12	217	215.00	0.92
instance n=1000 362.alb	1	1	Solution	30.04	225	223.00	0.89
instance n=1000 363.alb	1	1	Solution	30.06	217	215.00	0.92
instance n=1000 364.alb	1	1	Solution	30.10	223	221.00	0.90
instance n=1000 365.alb	1	1	Solution	30.05	230	227.00	1.30
instance n=1000 366.alb	1	1	Solution	30.10	230	228.00	0.87
instance n=1000 367.alb	1	1	Solution	30.10	229	227.00	0.87
instance n=1000 368.alb	1	1	Solution	30.13	228	226.00	0.88
instance n=1000 369.alb	1	1	Solution	30.16	223	220.00	1.35
instance n=1000 37.alb	1	1	Solution	30.17	550	506.00	8.00
instance n=1000 370.alb	1	1	Solution	30.05	226	223.00	1.33
instance n=1000 371.alb	1	1	Solution	30.16	222	220.00	0.90
instance n=1000 372.alb	1	1	Solution	30.20	233	230.00	1.29
instance n=1000 373.alb	1	1	Solution	30.13	221	219.00	0.90
instance n=1000 374.alb	1	1	Solution	30.06	221	219.00	0.90
instance n=1000 375.alb	1	1	Solution	30.07	229	227.00	0.87
instance n=1000 376.alb	1	1	Solution	30.11	133	132.00	0.75

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 377.alb	1	1	Solution	30.12	138	137.00	0.72
instance n=1000 378.alb	1	1	Solution	30.14	135	134.00	0.74
instance n=1000 379.alb	1	1	Solution	30.16	138	137.00	0.72
instance n=1000 38.alb	1	1	Solution	30.07	545	504.00	7.52
instance n=1000 380.alb	1	1	Solution	30.05	135	134.00	0.74
instance n=1000 381.alb	1	1	Solution	30.14	139	138.00	0.72
instance n=1000 382.alb	1	1	Solution	30.15	132	131.00	0.76
instance n=1000 383.alb	1	1	Solution	30.10	139	138.00	0.72
instance n=1000 384.alb	1	1	Solution	30.17	140	139.00	0.71
instance n=1000 385.alb	1	1	Solution	30.22	137	135.00	1.46
instance n=1000 386.alb	1	1	Solution	30.09	140	139.00	0.71
instance n=1000 387.alb	1	1	Solution	30.22	138	137.00	0.72
instance n=1000 388.alb	1	1	Solution	30.07	138	137.00	0.72
instance n=1000 389.alb	1	1	Solution	30.13	137	136.00	0.73
instance n=1000 39.alb	1	1	Solution	30.09	545	507.00	6.97
instance n=1000 390.alb	1	1	Solution	30.16	137	136.00	0.73
instance n=1000 391.alb	1	1	Solution	30.05	136	135.00	0.74
instance n=1000 392.alb	1	1	Solution	30.18	137	136.00	0.73
instance n=1000 393.alb	1	1	Solution	30.08	137	136.00	0.73
instance n=1000 394.alb	1	1	Solution	30.06	140	138.00	1.43
instance n=1000 395.alb	1	1	Solution	30.14	140	139.00	0.71
instance n=1000 396.alb	1	1	Solution	30.07	137	136.00	0.73
instance n=1000 397.alb	1	1	Solution	30.11	141	140.00	0.71
instance n=1000 398.alb	1	1	Solution	30.17	135	134.00	0.74
instance n=1000 399.alb	1	1	Solution	30.15	140	139.00	0.71
instance n=1000 4.alb	1	1	Solution	30.12	139	138.00	0.72
instance n=1000 40.alb	1	1	Solution	30.12	521	496.00	4.80
instance n=1000 400.alb	1	1	Solution	30.10	141	140.00	0.71
instance n=1000 401.alb	1	1	Solution	30.06	543	497.00	8.47
instance n=1000 402.alb	1	1	Solution	30.06	555	500.00	9.91
instance n=1000 403.alb	1	1	Solution	30.09	553	500.00	9.58
instance n=1000 404.alb	1	1	Solution	30.15	550	500.00	9.09
instance n=1000 405.alb	1	1	Solution	30.12	563	501.00	11.01
instance n=1000 406.alb	1	1	Solution	30.08	538	495.00	7.99
instance n=1000 407.alb	1	1	Solution	30.15	551	498.00	9.62
instance n=1000 408.alb	1	1	Solution	30.10	558	501.00	10.22
instance n=1000 409.alb	1	1	Solution	30.13	551	504.00	8.53
instance n=1000 41.alb	1	1	Solution	30.05	529	500.00	5.48
instance n=1000 410.alb	1	1	Solution	30.24	570	505.00	11.40
instance n=1000 411.alb	1	1	Solution	30.16	549	498.00	9.29
instance n=1000 412.alb	1	1	Solution	30.06	558	499.00	10.57
instance n=1000 413.alb	1	1	Solution	30.05	553	503.00	9.04
instance n=1000 414.alb	1	1	Solution	30.22	550	501.00	8.91
instance n=1000 415.alb	1	1	Solution	30.29	550	501.00	8.91

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 416.alb	1	1	Solution	30.03	558	502.00	10.04
instance n=1000 417.alb	1	1	Solution	30.03	583	512.00	12.18
instance n=1000 418.alb	1	1	Solution	30.06	550	501.00	8.91
instance n=1000 419.alb	1	1	Solution	30.06	575	510.00	11.30
instance n=1000 42.alb	1	1	Solution	30.14	520	497.00	4.42
instance n=1000 420.alb	1	1	Solution	30.11	555	501.00	9.73
instance n=1000 421.alb	1	1	Solution	30.06	554	499.00	9.93
instance n=1000 422.alb	1	1	Solution	30.09	546	495.00	9.34
instance n=1000 423.alb	1	1	Solution	30.05	559	500.00	10.55
instance n=1000 424.alb	1	1	Solution	30.05	542	495.00	8.67
instance n=1000 425.alb	1	1	Solution	30.12	563	504.00	10.48
instance n=1000 426.alb	1	1	Solution	30.05	227	224.00	1.32
instance n=1000 427.alb	1	1	Solution	30.18	233	229.00	1.72
instance n=1000 428.alb	1	1	Solution	30.21	227	224.00	1.32
instance n=1000 429.alb	1	1	Solution	30.03	238	235.00	1.26
instance n=1000 43.alb	1	1	Solution	30.15	524	496.00	5.34
instance n=1000 430.alb	1	1	Solution	30.16	223	220.00	1.35
instance n=1000 431.alb	1	1	Solution	30.10	233	230.00	1.29
instance n=1000 432.alb	1	1	Solution	30.17	231	227.00	1.73
instance n=1000 433.alb	1	1	Solution	30.13	233	229.00	1.72
instance n=1000 434.alb	1	1	Solution	30.21	214	212.00	0.93
instance n=1000 435.alb	1	1	Solution	30.18	230	227.00	1.30
instance n=1000 436.alb	1	1	Solution	30.06	230	226.00	1.74
instance n=1000 437.alb	1	1	Solution	30.22	225	222.00	1.33
instance n=1000 438.alb	1	1	Solution	30.06	224	221.00	1.34
instance n=1000 439.alb	1	1	Solution	30.25	228	225.00	1.32
instance n=1000 44.alb	1	1	Solution	30.17	543	502.00	7.55
instance n=1000 440.alb	1	1	Solution	30.10	228	225.00	1.32
instance n=1000 441.alb	1	1	Solution	30.05	225	221.00	1.78
instance n=1000 442.alb	1	1	Solution	30.04	233	230.00	1.29
instance n=1000 443.alb	1	1	Solution	30.08	220	217.00	1.36
instance n=1000 444.alb	1	1	Solution	30.20	225	222.00	1.33
instance n=1000 445.alb	1	1	Solution	30.19	233	229.00	1.72
instance n=1000 446.alb	1	1	Solution	30.08	230	228.00	0.87
instance n=1000 447.alb	1	1	Solution	30.17	225	221.00	1.78
instance n=1000 448.alb	1	1	Solution	30.06	225	222.00	1.33
instance n=1000 449.alb	1	1	Solution	30.06	236	232.00	1.69
instance n=1000 45.alb	1	1	Solution	30.08	513	492.00	4.09
instance n=1000 450.alb	1	1	Solution	30.22	223	220.00	1.35
instance n=1000 451.alb	1	1	Solution	30.15	139	136.00	2.16
instance n=1000 452.alb	1	1	Solution	30.10	134	132.00	1.49
instance n=1000 453.alb	1	1	Solution	30.13	140	138.00	1.43
instance n=1000 454.alb	1	1	Solution	30.06	141	139.00	1.42
instance n=1000 455.alb	1	1	Solution	30.22	138	136.00	1.45

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 456.alb	1	1	Solution	30.20	137	135.00	1.46
instance n=1000 457.alb	1	1	Solution	30.13	139	137.00	1.44
instance n=1000 458.alb	1	1	Solution	30.13	136	135.00	0.74
instance n=1000 459.alb	1	1	Solution	30.27	139	137.00	1.44
instance n=1000 46.alb	1	1	Solution	30.22	527	498.00	5.50
instance n=1000 460.alb	1	1	Solution	30.19	140	138.00	1.43
instance n=1000 461.alb	1	1	Solution	30.25	139	137.00	1.44
instance n=1000 462.alb	1	1	Solution	30.30	138	136.00	1.45
instance n=1000 463.alb	1	1	Solution	30.08	138	136.00	1.45
instance n=1000 464.alb	1	1	Solution	30.09	140	138.00	1.43
instance n=1000 465.alb	1	1	Solution	30.14	140	138.00	1.43
instance n=1000 466.alb	1	1	Solution	30.09	135	133.00	1.48
instance n=1000 467.alb	1	1	Solution	30.08	140	138.00	1.43
instance n=1000 468.alb	1	1	Solution	30.10	138	137.00	0.72
instance n=1000 469.alb	1	1	Solution	30.14	139	137.00	1.44
instance n=1000 47.alb	1	1	Solution	30.06	527	499.00	5.31
instance n=1000 470.alb	1	1	Solution	30.13	136	135.00	0.74
instance n=1000 471.alb	1	1	Solution	30.22	137	135.00	1.46
instance n=1000 472.alb	1	1	Solution	30.13	142	140.00	1.41
instance n=1000 473.alb	1	1	Solution	30.10	137	135.00	1.46
instance n=1000 474.alb	1	1	Solution	30.13	138	136.00	1.45
instance n=1000 475.alb	1	1	Solution	30.18	138	136.00	1.45
instance n=1000 476.alb	1	1	Solution	30.09	581	503.00	13.43
instance n=1000 477.alb	1	1	Solution	30.28	586	507.00	13.48
instance n=1000 479.alb	1	1	Solution	30.10	577	503.00	12.82
instance n=1000 48.alb	1	1	Solution	30.06	559	508.00	9.12
instance n=1000 480.alb	1	1	Solution	30.17	568	498.00	12.32
instance n=1000 481.alb	1	1	Solution	30.09	582	504.00	13.40
instance n=1000 483.alb	1	1	Solution	30.14	566	499.00	11.84
instance n=1000 484.alb	1	1	Solution	30.14	594	508.00	14.48
instance n=1000 485.alb	1	1	Solution	30.15	582	505.00	13.23
instance n=1000 486.alb	1	1	Solution	30.08	574	500.00	12.89
instance n=1000 487.alb	1	1	Solution	30.23	587	502.00	14.48
instance n=1000 488.alb	1	1	Solution	30.06	576	502.00	12.85
instance n=1000 489.alb	1	1	Solution	30.06	568	498.00	12.32
instance n=1000 49.alb	1	1	Solution	30.09	530	500.00	5.66
instance n=1000 490.alb	1	1	Solution	30.18	576	501.00	13.02
instance n=1000 491.alb	1	1	Solution	30.09	571	500.00	12.43
instance n=1000 492.alb	1	1	Solution	30.11	591	509.00	13.87
instance n=1000 493.alb	1	1	Solution	30.30	561	495.00	11.76
instance n=1000 494.alb	1	1	Solution	30.15	575	500.00	13.04
instance n=1000 495.alb	1	1	Solution	30.09	596	134.00	77.52
instance n=1000 496.alb	1	1	Solution	30.14	565	495.00	12.39
instance n=1000 497.alb	1	1	Solution	30.09	568	499.00	12.15

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 498.alb	1	1	Solution	30.06	587	506.00	13.80
instance n=1000 499.alb	1	1	Solution	30.31	570	499.00	12.46
instance n=1000 5.alb	1	1	Solution	30.06	136	135.00	0.74
instance n=1000 50.alb	1	1	Solution	30.08	515	493.00	4.27
instance n=1000 500.alb	1	1	Solution	30.36	575	503.00	12.52
instance n=1000 501.alb	1	1	Solution	30.30	232	227.00	2.16
instance n=1000 502.alb	1	1	Solution	30.31	230	224.00	2.61
instance n=1000 503.alb	1	1	Solution	30.11	231	224.00	3.03
instance n=1000 504.alb	1	1	Solution	30.08	233	227.00	2.58
instance n=1000 505.alb	1	1	Solution	30.09	218	213.00	2.29
instance n=1000 506.alb	1	1	Solution	30.30	229	223.00	2.62
instance n=1000 507.alb	1	1	Solution	30.31	226	220.00	2.65
instance n=1000 508.alb	1	1	Solution	30.07	223	219.00	1.79
instance n=1000 509.alb	1	1	Solution	30.31	230	225.00	2.17
instance n=1000 51.alb	1	1	Solution	30.10	228	226.00	0.88
instance n=1000 510.alb	1	1	Solution	30.41	232	226.00	2.59
instance n=1000 511.alb	1	1	Solution	30.20	236	230.00	2.54
instance n=1000 512.alb	1	1	Solution	30.08	224	219.00	2.23
instance n=1000 513.alb	1	1	Solution	30.12	225	219.00	2.67
instance n=1000 514.alb	1	1	Solution	30.11	233	226.00	3.00
instance n=1000 515.alb	1	1	Solution	30.17	226	221.00	2.21
instance n=1000 516.alb	1	1	Solution	30.13	235	229.00	2.55
instance n=1000 517.alb	1	1	Solution	30.32	227	221.00	2.64
instance n=1000 518.alb	1	1	Solution	30.30	225	220.00	2.22
instance n=1000 519.alb	1	1	Solution	30.08	227	221.00	2.64
instance n=1000 52.alb	1	1	Solution	30.17	230	228.00	0.87
instance n=1000 520.alb	1	1	Solution	30.14	231	226.00	2.16
instance n=1000 521.alb	1	1	Solution	30.26	235	229.00	2.55
instance n=1000 522.alb	1	1	Solution	30.21	220	215.00	2.27
instance n=1000 523.alb	1	1	Solution	30.08	225	220.00	2.22
instance n=1000 524.alb	1	1	Solution	30.26	232	225.00	3.02
instance n=1000 525.alb	1	1	Solution	30.28	226	221.00	2.21
instance n=1000 53.alb	1	1	Solution	30.07	229	227.00	0.87
instance n=1000 54.alb	1	1	Solution	30.20	221	219.00	0.90
instance n=1000 55.alb	1	1	Solution	30.05	219	217.00	0.91
instance n=1000 56.alb	1	1	Solution	30.29	230	228.00	0.87
instance n=1000 57.alb	1	1	Solution	30.13	226	224.00	0.88
instance n=1000 58.alb	1	1	Solution	30.14	225	224.00	0.44
instance n=1000 59.alb	1	1	Solution	30.30	225	223.00	0.89
instance n=1000 6.alb	1	1	Solution	30.12	142	141.00	0.70
instance n=1000 60.alb	1	1	Solution	30.17	232	230.00	0.86
instance n=1000 61.alb	1	1	Solution	30.07	231	229.00	0.87
instance n=1000 62.alb	1	1	Solution	30.22	225	223.00	0.89
instance n=1000 63.alb	1	1	Solution	30.05	228	227.00	0.44

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 64.alb	1	1	Solution	30.05	231	229.00	0.87
instance n=1000 65.alb	1	1	Solution	30.11	226	225.00	0.44
instance n=1000 66.alb	1	1	Solution	30.08	229	227.00	0.87
instance n=1000 67.alb	1	1	Solution	30.07	224	223.00	0.45
instance n=1000 68.alb	1	1	Solution	30.24	228	226.00	0.88
instance n=1000 69.alb	1	1	Solution	30.35	226	224.00	0.88
instance n=1000 7.alb	1	1	Solution	30.27	137	136.00	0.73
instance n=1000 70.alb	1	1	Solution	30.07	230	228.00	0.87
instance n=1000 71.alb	1	1	Solution	30.07	232	230.00	0.86
instance n=1000 72.alb	1	1	Solution	30.08	224	222.00	0.89
instance n=1000 73.alb	1	1	Solution	30.09	223	221.00	0.90
instance n=1000 74.alb	1	1	Solution	30.05	229	227.00	0.87
instance n=1000 75.alb	1	1	Solution	30.13	229	227.00	0.87
instance n=1000 76.alb	1	1	Solution	30.32	137	136.00	0.73
instance n=1000 77.alb	1	1	Solution	30.05	137	136.00	0.73
instance n=1000 78.alb	1	1	Solution	30.08	140	138.00	1.43
instance n=1000 79.alb	1	1	Solution	30.10	143	142.00	0.70
instance n=1000 8.alb	1	1	Solution	30.12	139	138.00	0.72
instance n=1000 80.alb	1	1	Solution	30.24	141	140.00	0.71
instance n=1000 81.alb	1	1	Solution	30.05	137	136.00	0.73
instance n=1000 82.alb	1	1	Solution	30.13	137	136.00	0.73
instance n=1000 83.alb	1	1	Solution	30.05	140	140.00	0.00
instance n=1000 84.alb	1	1	Solution	30.11	136	135.00	0.74
instance n=1000 85.alb	1	1	Solution	30.15	137	136.00	0.73
instance n=1000 86.alb	1	1	Solution	30.16	139	138.00	0.72
instance n=1000 87.alb	1	1	Solution	30.06	141	140.00	0.71
instance n=1000 88.alb	1	1	Solution	30.09	141	140.00	0.71
instance n=1000 89.alb	1	1	Solution	30.42	141	140.00	0.71
instance n=1000 9.alb	1	1	Solution	30.06	135	134.00	0.74
instance n=1000 90.alb	1	1	Solution	30.05	138	138.00	0.00
instance n=1000 91.alb	1	1	Solution	30.06	142	141.00	0.70
instance n=1000 92.alb	1	1	Solution	30.12	137	136.00	0.73
instance n=1000 93.alb	1	1	Solution	30.05	138	137.00	0.72
instance n=1000 94.alb	1	1	Solution	30.30	138	137.00	0.72
instance n=1000 95.alb	1	1	Solution	30.13	137	136.00	0.73
instance n=1000 96.alb	1	1	Solution	30.12	138	137.00	0.72
instance n=1000 97.alb	1	1	Solution	30.25	139	138.00	0.72
instance n=1000 98.alb	1	1	Solution	30.06	136	136.00	0.00
instance n=1000 99.alb	1	1	Solution	30.32	137	136.00	0.73
instance n=100 1.alb	1	1	Solution	30.08	23	23.00	0.00
instance n=100 10.alb	1	1	Solution	30.03	22	22.00	0.00
instance n=100 100.alb	1	1	Solution	30.08	25	25.00	0.00
instance n=100 101.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 102.alb	1	1	Optimal	13.73	14	14.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 103.alb	1	1	Optimal	20.59	14	14.00	0.00
instance n=100 104.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 105.alb	1	1	Solution	30.08	13	13.00	0.00
instance n=100 106.alb	1	1	Optimal	4.77	14	14.00	0.00
instance n=100 107.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 108.alb	1	1	Solution	30.03	15	14.00	6.67
instance n=100 109.alb	1	1	Solution	30.08	15	15.00	0.00
instance n=100 11.alb	1	1	Solution	30.03	24	24.00	0.00
instance n=100 110.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=100 111.alb	1	1	Solution	30.06	16	16.00	0.00
instance n=100 112.alb	1	1	Solution	30.02	13	13.00	0.00
instance n=100 113.alb	1	1	Optimal	19.77	14	14.00	0.00
instance n=100 114.alb	1	1	Solution	30.10	13	13.00	0.00
instance n=100 115.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 116.alb	1	1	Solution	30.03	16	16.00	0.00
instance n=100 117.alb	1	1	Solution	30.08	15	15.00	0.00
instance n=100 118.alb	1	1	Solution	30.08	15	15.00	0.00
instance n=100 119.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 12.alb	1	1	Solution	30.06	25	25.00	0.00
instance n=100 120.alb	1	1	Solution	30.03	14	14.00	0.00
instance n=100 121.alb	1	1	Solution	30.03	15	15.00	0.00
instance n=100 122.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=100 123.alb	1	1	Solution	30.08	15	15.00	0.00
instance n=100 124.alb	1	1	Solution	30.09	15	15.00	0.00
instance n=100 125.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 126.alb	1	1	Solution	30.07	51	49.00	3.92
instance n=100 127.alb	1	1	Solution	30.08	53	49.00	7.55
instance n=100 128.alb	1	1	Solution	30.04	57	52.00	8.77
instance n=100 129.alb	1	1	Solution	30.07	55	50.00	9.09
instance n=100 13.alb	1	1	Solution	30.08	24	24.00	0.00
instance n=100 130.alb	1	1	Solution	30.08	56	51.00	8.93
instance n=100 131.alb	1	1	Solution	30.10	53	50.00	5.66
instance n=100 132.alb	1	1	Solution	30.05	58	52.00	10.34
instance n=100 133.alb	1	1	Solution	30.08	57	51.00	10.53
instance n=100 134.alb	1	1	Solution	30.06	55	51.00	7.27
instance n=100 135.alb	1	1	Solution	30.06	55	51.00	7.27
instance n=100 136.alb	1	1	Solution	30.06	54	49.00	9.26
instance n=100 137.alb	1	1	Solution	30.06	54	50.00	7.41
instance n=100 138.alb	1	1	Solution	30.05	57	52.00	8.77
instance n=100 139.alb	1	1	Solution	30.06	52	49.00	5.77
instance n=100 14.alb	1	1	Solution	30.07	20	20.00	0.00
instance n=100 140.alb	1	1	Solution	30.05	55	51.00	7.27
instance n=100 141.alb	1	1	Solution	30.05	51	49.00	3.92
instance n=100 142.alb	1	1	Solution	30.07	55	50.00	9.09

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 143.alb	1	1	Solution	30.06	54	50.00	7.41
instance n=100 144.alb	1	1	Solution	30.06	49	47.00	4.08
instance n=100 145.alb	1	1	Solution	30.07	57	51.00	10.53
instance n=100 146.alb	1	1	Solution	30.06	53	50.00	5.66
instance n=100 147.alb	1	1	Solution	30.06	60	52.00	13.33
instance n=100 148.alb	1	1	Solution	30.05	54	50.00	7.41
instance n=100 149.alb	1	1	Solution	30.01	55	51.00	7.27
instance n=100 15.alb	1	1	Solution	30.06	24	24.00	0.00
instance n=100 150.alb	1	1	Solution	30.06	57	51.00	10.53
instance n=100 151.alb	1	1	Solution	30.07	22	21.00	4.55
instance n=100 152.alb	1	1	Solution	30.07	22	22.00	0.00
instance n=100 153.alb	1	1	Solution	30.06	21	21.00	0.00
instance n=100 154.alb	1	1	Solution	30.06	25	25.00	0.00
instance n=100 155.alb	1	1	Solution	30.06	22	22.00	0.00
instance n=100 156.alb	1	1	Solution	30.02	23	23.00	0.00
instance n=100 157.alb	1	1	Solution	30.06	26	26.00	0.00
instance n=100 158.alb	1	1	Solution	30.09	23	23.00	0.00
instance n=100 159.alb	1	1	Solution	30.06	19	19.00	0.00
instance n=100 16.alb	1	1	Solution	30.07	23	23.00	0.00
instance n=100 160.alb	1	1	Solution	30.05	22	22.00	0.00
instance n=100 161.alb	1	1	Solution	30.08	23	22.00	4.35
instance n=100 162.alb	1	1	Solution	30.08	23	22.00	4.35
instance n=100 163.alb	1	1	Solution	30.07	25	25.00	0.00
instance n=100 164.alb	1	1	Solution	30.08	23	23.00	0.00
instance n=100 165.alb	1	1	Solution	30.06	25	24.00	4.00
instance n=100 166.alb	1	1	Solution	30.06	24	24.00	0.00
instance n=100 167.alb	1	1	Solution	30.03	22	22.00	0.00
instance n=100 168.alb	1	1	Solution	30.01	21	21.00	0.00
instance n=100 169.alb	1	1	Solution	30.06	21	21.00	0.00
instance n=100 17.alb	1	1	Solution	30.05	22	21.00	4.55
instance n=100 170.alb	1	1	Solution	30.04	24	24.00	0.00
instance n=100 171.alb	1	1	Solution	30.06	24	24.00	0.00
instance n=100 172.alb	1	1	Solution	30.03	24	24.00	0.00
instance n=100 173.alb	1	1	Solution	30.10	25	24.00	4.00
instance n=100 174.alb	1	1	Solution	30.08	22	22.00	0.00
instance n=100 175.alb	1	1	Solution	30.06	27	26.00	3.70
instance n=100 176.alb	1	1	Solution	30.08	13	13.00	0.00
instance n=100 177.alb	1	1	Solution	30.10	14	14.00	0.00
instance n=100 178.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=100 179.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=100 18.alb	1	1	Solution	30.06	20	19.00	5.00
instance n=100 180.alb	1	1	Solution	30.08	15	15.00	0.00
instance n=100 181.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=100 182.alb	1	1	Solution	30.07	15	15.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 183.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 184.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 185.alb	1	1	Solution	30.10	15	15.00	0.00
instance n=100 186.alb	1	1	Solution	30.04	14	14.00	0.00
instance n=100 187.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=100 188.alb	1	1	Solution	30.06	16	16.00	0.00
instance n=100 189.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 19.alb	1	1	Solution	30.04	23	23.00	0.00
instance n=100 190.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=100 191.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 192.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=100 193.alb	1	1	Solution	30.04	15	15.00	0.00
instance n=100 194.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=100 195.alb	1	1	Solution	30.02	15	15.00	0.00
instance n=100 196.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 197.alb	1	1	Solution	30.03	15	15.00	0.00
instance n=100 198.alb	1	1	Solution	30.07	13	13.00	0.00
instance n=100 199.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 2.alb	1	1	Solution	30.07	21	21.00	0.00
instance n=100 20.alb	1	1	Solution	30.04	21	21.00	0.00
instance n=100 200.alb	1	1	Solution	30.04	15	15.00	0.00
instance n=100 201.alb	1	1	Solution	30.08	53	50.00	5.66
instance n=100 202.alb	1	1	Solution	30.03	61	52.00	14.75
instance n=100 203.alb	1	1	Solution	30.02	52	49.00	5.77
instance n=100 204.alb	1	1	Solution	30.08	50	48.00	4.00
instance n=100 205.alb	1	1	Solution	30.06	57	51.00	10.53
instance n=100 206.alb	1	1	Solution	30.08	52	49.00	5.77
instance n=100 207.alb	1	1	Solution	30.08	51	49.00	3.92
instance n=100 208.alb	1	1	Solution	30.05	57	51.00	10.53
instance n=100 209.alb	1	1	Solution	30.07	56	51.00	8.93
instance n=100 21.alb	1	1	Solution	30.07	21	21.00	0.00
instance n=100 210.alb	1	1	Solution	30.06	52	49.00	5.77
instance n=100 211.alb	1	1	Solution	30.04	52	49.00	5.77
instance n=100 212.alb	1	1	Solution	30.08	52	50.00	3.85
instance n=100 213.alb	1	1	Solution	30.06	53	50.00	5.66
instance n=100 214.alb	1	1	Solution	30.03	55	50.00	9.09
instance n=100 215.alb	1	1	Solution	30.06	49	47.00	4.08
instance n=100 216.alb	1	1	Solution	30.07	53	50.00	5.66
instance n=100 217.alb	1	1	Solution	30.03	52	49.00	5.77
instance n=100 218.alb	1	1	Solution	30.10	54	50.00	7.41
instance n=100 219.alb	1	1	Solution	30.05	52	49.00	5.77
instance n=100 22.alb	1	1	Solution	30.07	25	24.00	4.00
instance n=100 220.alb	1	1	Solution	30.08	53	50.00	5.66
instance n=100 221.alb	1	1	Solution	30.05	57	51.00	10.53

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 222.alb	1	1	Solution	30.05	53	50.00	5.66
instance n=100 223.alb	1	1	Solution	30.08	51	49.00	3.92
instance n=100 224.alb	1	1	Solution	30.06	55	51.00	7.27
instance n=100 225.alb	1	1	Solution	30.06	53	50.00	5.66
instance n=100 226.alb	1	1	Solution	30.07	25	24.00	4.00
instance n=100 227.alb	1	1	Solution	30.02	27	26.00	3.70
instance n=100 228.alb	1	1	Solution	30.06	22	22.00	0.00
instance n=100 229.alb	1	1	Solution	30.08	24	24.00	0.00
instance n=100 23.alb	1	1	Solution	30.09	24	24.00	0.00
instance n=100 230.alb	1	1	Solution	30.05	24	23.00	4.17
instance n=100 231.alb	1	1	Solution	30.08	22	22.00	0.00
instance n=100 232.alb	1	1	Solution	30.08	22	22.00	0.00
instance n=100 233.alb	1	1	Solution	30.05	23	22.00	4.35
instance n=100 234.alb	1	1	Solution	30.10	23	23.00	0.00
instance n=100 235.alb	1	1	Solution	30.08	26	26.00	0.00
instance n=100 236.alb	1	1	Solution	30.06	23	22.00	4.35
instance n=100 237.alb	1	1	Solution	30.05	23	23.00	0.00
instance n=100 238.alb	1	1	Solution	30.07	23	23.00	0.00
instance n=100 239.alb	1	1	Solution	30.05	21	21.00	0.00
instance n=100 24.alb	1	1	Solution	30.07	24	24.00	0.00
instance n=100 240.alb	1	1	Solution	30.05	22	22.00	0.00
instance n=100 241.alb	1	1	Solution	30.04	22	22.00	0.00
instance n=100 242.alb	1	1	Solution	30.05	23	23.00	0.00
instance n=100 243.alb	1	1	Solution	30.03	23	23.00	0.00
instance n=100 244.alb	1	1	Solution	30.09	21	21.00	0.00
instance n=100 245.alb	1	1	Solution	30.02	24	23.00	4.17
instance n=100 246.alb	1	1	Solution	30.09	26	26.00	0.00
instance n=100 247.alb	1	1	Solution	30.09	22	22.00	0.00
instance n=100 248.alb	1	1	Solution	30.02	19	19.00	0.00
instance n=100 249.alb	1	1	Solution	30.06	21	21.00	0.00
instance n=100 25.alb	1	1	Solution	30.03	22	22.00	0.00
instance n=100 250.alb	1	1	Solution	30.03	24	24.00	0.00
instance n=100 251.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=100 252.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 253.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 254.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 255.alb	1	1	Optimal	1.64	14	14.00	0.00
instance n=100 256.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 257.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=100 258.alb	1	1	Solution	30.04	14	14.00	0.00
instance n=100 259.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 26.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 260.alb	1	1	Solution	30.03	15	15.00	0.00
instance n=100 261.alb	1	1	Optimal	15.72	14	14.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 262.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 263.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 264.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 265.alb	1	1	Optimal	25.78	14	14.00	0.00
instance n=100 266.alb	1	1	Solution	30.10	13	13.00	0.00
instance n=100 267.alb	1	1	Solution	30.08	13	13.00	0.00
instance n=100 268.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 269.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 27.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=100 270.alb	1	1	Solution	30.03	13	13.00	0.00
instance n=100 271.alb	1	1	Solution	30.03	13	13.00	0.00
instance n=100 272.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 273.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=100 274.alb	1	1	Solution	30.01	13	13.00	0.00
instance n=100 275.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=100 276.alb	1	1	Solution	30.04	61	51.00	16.39
instance n=100 277.alb	1	1	Solution	30.08	57	51.00	10.53
instance n=100 278.alb	1	1	Solution	30.05	57	51.00	10.53
instance n=100 279.alb	1	1	Solution	30.06	55	50.00	9.09
instance n=100 28.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 280.alb	1	1	Solution	30.09	56	50.00	10.71
instance n=100 281.alb	1	1	Solution	30.05	62	53.00	14.52
instance n=100 282.alb	1	1	Solution	30.08	61	52.00	14.75
instance n=100 283.alb	1	1	Solution	30.08	55	50.00	9.09
instance n=100 284.alb	1	1	Solution	30.08	56	50.00	10.71
instance n=100 285.alb	1	1	Solution	30.09	55	50.00	9.09
instance n=100 286.alb	1	1	Solution	30.08	57	51.00	10.53
instance n=100 287.alb	1	1	Solution	30.08	55	50.00	9.09
instance n=100 288.alb	1	1	Solution	30.07	56	51.00	8.93
instance n=100 289.alb	1	1	Solution	30.08	62	51.00	17.74
instance n=100 29.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 290.alb	1	1	Solution	30.08	55	50.00	9.09
instance n=100 291.alb	1	1	Solution	30.09	53	49.00	7.55
instance n=100 292.alb	1	1	Solution	30.06	59	51.00	13.56
instance n=100 293.alb	1	1	Solution	30.06	53	49.00	7.55
instance n=100 294.alb	1	1	Solution	30.05	57	51.00	10.53
instance n=100 295.alb	1	1	Solution	30.06	57	51.00	10.53
instance n=100 296.alb	1	1	Solution	30.05	56	50.00	10.71
instance n=100 297.alb	1	1	Solution	30.06	59	51.00	13.56
instance n=100 298.alb	1	1	Solution	30.03	59	52.00	11.86
instance n=100 299.alb	1	1	Solution	30.06	55	50.00	9.09
instance n=100 3.alb	1	1	Solution	30.03	20	20.00	0.00
instance n=100 30.alb	1	1	Solution	30.07	15	15.00	0.00
instance n=100 300.alb	1	1	Solution	30.05	54	49.00	9.26

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 301.alb	1	1	Solution	30.07	23	23.00	0.00
instance n=100 302.alb	1	1	Solution	30.03	24	24.00	0.00
instance n=100 303.alb	1	1	Solution	30.09	24	24.00	0.00
instance n=100 304.alb	1	1	Solution	30.05	21	21.00	0.00
instance n=100 305.alb	1	1	Solution	30.05	22	22.00	0.00
instance n=100 306.alb	1	1	Solution	30.02	24	24.00	0.00
instance n=100 307.alb	1	1	Solution	30.06	24	23.00	4.17
instance n=100 308.alb	1	1	Solution	30.10	21	20.00	4.76
instance n=100 309.alb	1	1	Solution	30.08	22	21.00	4.55
instance n=100 31.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 310.alb	1	1	Solution	30.08	23	23.00	0.00
instance n=100 311.alb	1	1	Solution	30.05	21	21.00	0.00
instance n=100 312.alb	1	1	Solution	30.03	22	22.00	0.00
instance n=100 313.alb	1	1	Solution	30.05	23	23.00	0.00
instance n=100 314.alb	1	1	Solution	30.08	19	19.00	0.00
instance n=100 315.alb	1	1	Solution	30.06	22	22.00	0.00
instance n=100 316.alb	1	1	Solution	30.05	24	24.00	0.00
instance n=100 317.alb	1	1	Solution	30.06	26	26.00	0.00
instance n=100 318.alb	1	1	Solution	30.06	21	21.00	0.00
instance n=100 319.alb	1	1	Solution	30.06	23	23.00	0.00
instance n=100 32.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 320.alb	1	1	Solution	30.08	22	22.00	0.00
instance n=100 321.alb	1	1	Solution	30.07	26	26.00	0.00
instance n=100 322.alb	1	1	Solution	30.06	23	23.00	0.00
instance n=100 323.alb	1	1	Solution	30.04	24	24.00	0.00
instance n=100 324.alb	1	1	Solution	30.02	23	23.00	0.00
instance n=100 325.alb	1	1	Solution	30.05	25	25.00	0.00
instance n=100 326.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=100 327.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 328.alb	1	1	Solution	30.10	14	14.00	0.00
instance n=100 329.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 33.alb	1	1	Solution	30.07	15	15.00	0.00
instance n=100 330.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 331.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 332.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 333.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 334.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 335.alb	1	1	Optimal	22.17	13	13.00	0.00
instance n=100 336.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 337.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=100 338.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 339.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 34.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=100 340.alb	1	1	Solution	30.04	14	14.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 341.alb	1	1	Solution	30.09	16	16.00	0.00
instance n=100 342.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 343.alb	1	1	Solution	30.07	16	16.00	0.00
instance n=100 344.alb	1	1	Solution	30.07	15	15.00	0.00
instance n=100 345.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 346.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 347.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 348.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 349.alb	1	1	Solution	30.08	13	13.00	0.00
instance n=100 35.alb	1	1	Solution	30.08	15	15.00	0.00
instance n=100 350.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 351.alb	1	1	Solution	30.10	59	52.00	11.86
instance n=100 352.alb	1	1	Solution	30.08	63	52.00	17.46
instance n=100 353.alb	1	1	Solution	30.08	51	49.00	3.92
instance n=100 354.alb	1	1	Solution	30.06	52	49.00	5.77
instance n=100 355.alb	1	1	Solution	30.08	55	51.00	7.27
instance n=100 356.alb	1	1	Solution	30.06	60	53.00	11.67
instance n=100 357.alb	1	1	Solution	30.05	53	50.00	5.66
instance n=100 358.alb	1	1	Solution	30.06	52	50.00	3.85
instance n=100 359.alb	1	1	Solution	30.02	54	50.00	7.41
instance n=100 36.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 360.alb	1	1	Solution	30.10	56	51.00	8.93
instance n=100 361.alb	1	1	Solution	30.06	51	49.00	3.92
instance n=100 362.alb	1	1	Solution	30.08	58	51.00	12.07
instance n=100 363.alb	1	1	Solution	30.08	52	50.00	3.85
instance n=100 364.alb	1	1	Solution	30.08	53	50.00	5.66
instance n=100 365.alb	1	1	Solution	30.06	54	50.00	7.41
instance n=100 366.alb	1	1	Solution	30.06	62	53.00	14.52
instance n=100 367.alb	1	1	Solution	30.02	56	51.00	8.93
instance n=100 368.alb	1	1	Solution	30.06	59	52.00	11.86
instance n=100 369.alb	1	1	Solution	30.07	52	49.00	5.77
instance n=100 37.alb	1	1	Solution	30.04	14	14.00	0.00
instance n=100 370.alb	1	1	Solution	30.05	57	52.00	8.77
instance n=100 371.alb	1	1	Solution	30.05	54	50.00	7.41
instance n=100 372.alb	1	1	Solution	30.05	49	47.00	4.08
instance n=100 373.alb	1	1	Solution	30.07	51	49.00	3.92
instance n=100 374.alb	1	1	Solution	30.05	51	50.00	1.96
instance n=100 375.alb	1	1	Solution	30.08	57	52.00	8.77
instance n=100 376.alb	1	1	Solution	30.09	23	23.00	0.00
instance n=100 377.alb	1	1	Solution	30.05	21	20.00	4.76
instance n=100 378.alb	1	1	Solution	30.09	22	22.00	0.00
instance n=100 379.alb	1	1	Solution	30.07	23	23.00	0.00
instance n=100 38.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 380.alb	1	1	Solution	30.04	23	22.00	4.35

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 381.alb	1	1	Solution	30.03	24	24.00	0.00
instance n=100 382.alb	1	1	Solution	30.07	25	25.00	0.00
instance n=100 383.alb	1	1	Solution	30.05	25	25.00	0.00
instance n=100 384.alb	1	1	Solution	30.06	25	25.00	0.00
instance n=100 385.alb	1	1	Solution	30.03	22	22.00	0.00
instance n=100 386.alb	1	1	Solution	30.06	24	23.00	4.17
instance n=100 387.alb	1	1	Solution	30.07	22	22.00	0.00
instance n=100 388.alb	1	1	Solution	30.09	26	25.00	3.85
instance n=100 389.alb	1	1	Solution	30.03	23	23.00	0.00
instance n=100 39.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 390.alb	1	1	Solution	30.06	23	22.00	4.35
instance n=100 391.alb	1	1	Solution	30.05	20	20.00	0.00
instance n=100 392.alb	1	1	Solution	30.06	22	22.00	0.00
instance n=100 393.alb	1	1	Solution	30.10	24	23.00	4.17
instance n=100 394.alb	1	1	Solution	30.07	22	22.00	0.00
instance n=100 395.alb	1	1	Solution	30.04	24	24.00	0.00
instance n=100 396.alb	1	1	Solution	30.05	20	20.00	0.00
instance n=100 397.alb	1	1	Solution	30.04	26	25.00	3.85
instance n=100 398.alb	1	1	Solution	30.07	25	24.00	4.00
instance n=100 399.alb	1	1	Solution	30.07	23	23.00	0.00
instance n=100 4.alb	1	1	Solution	30.07	24	24.00	0.00
instance n=100 40.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 400.alb	1	1	Solution	30.06	24	24.00	0.00
instance n=100 401.alb	1	1	Solution	30.09	15	15.00	0.00
instance n=100 402.alb	1	1	Solution	30.07	15	15.00	0.00
instance n=100 403.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 404.alb	1	1	Optimal	25.81	15	15.00	0.00
instance n=100 405.alb	1	1	Solution	30.07	13	13.00	0.00
instance n=100 406.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 407.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=100 408.alb	1	1	Solution	30.03	14	14.00	0.00
instance n=100 409.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=100 41.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=100 410.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 411.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 412.alb	1	1	Solution	30.02	14	14.00	0.00
instance n=100 413.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 414.alb	1	1	Solution	30.06	14	14.00	0.00
instance n=100 415.alb	1	1	Solution	30.08	13	13.00	0.00
instance n=100 416.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 417.alb	1	1	Solution	30.06	15	15.00	0.00
instance n=100 418.alb	1	1	Solution	30.08	16	16.00	0.00
instance n=100 419.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 42.alb	1	1	Solution	30.05	14	14.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 420.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 421.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 422.alb	1	1	Solution	30.04	15	15.00	0.00
instance n=100 423.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 424.alb	1	1	Solution	30.04	14	14.00	0.00
instance n=100 425.alb	1	1	Solution	30.07	15	15.00	0.00
instance n=100 426.alb	1	1	Solution	30.08	60	53.00	11.67
instance n=100 427.alb	1	1	Solution	30.06	56	50.00	10.71
instance n=100 428.alb	1	1	Solution	30.07	55	51.00	7.27
instance n=100 429.alb	1	1	Solution	30.06	58	52.00	10.34
instance n=100 43.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 430.alb	1	1	Solution	30.05	55	50.00	9.09
instance n=100 431.alb	1	1	Solution	30.08	54	50.00	7.41
instance n=100 432.alb	1	1	Solution	30.05	56	50.00	10.71
instance n=100 433.alb	1	1	Solution	30.06	53	49.00	7.55
instance n=100 434.alb	1	1	Solution	30.06	57	51.00	10.53
instance n=100 435.alb	1	1	Solution	30.07	57	50.00	12.28
instance n=100 436.alb	1	1	Solution	30.07	52	48.00	7.69
instance n=100 437.alb	1	1	Solution	30.05	53	50.00	5.66
instance n=100 438.alb	1	1	Solution	30.07	55	51.00	7.27
instance n=100 439.alb	1	1	Solution	30.07	55	51.00	7.27
instance n=100 44.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 440.alb	1	1	Solution	30.03	54	49.00	9.26
instance n=100 441.alb	1	1	Solution	30.05	53	49.00	7.55
instance n=100 442.alb	1	1	Solution	30.04	53	48.00	9.43
instance n=100 443.alb	1	1	Solution	30.05	56	50.00	10.71
instance n=100 444.alb	1	1	Solution	30.06	54	50.00	7.41
instance n=100 445.alb	1	1	Solution	30.07	57	51.00	10.53
instance n=100 446.alb	1	1	Solution	30.05	57	51.00	10.53
instance n=100 447.alb	1	1	Solution	30.05	54	50.00	7.41
instance n=100 448.alb	1	1	Solution	30.05	56	51.00	8.93
instance n=100 449.alb	1	1	Solution	30.08	55	50.00	9.09
instance n=100 45.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 450.alb	1	1	Solution	30.09	54	50.00	7.41
instance n=100 451.alb	1	1	Optimal	17.62	26	26.00	0.00
instance n=100 452.alb	1	1	Solution	30.05	22	22.00	0.00
instance n=100 453.alb	1	1	Optimal	22.31	24	24.00	0.00
instance n=100 454.alb	1	1	Optimal	18.51	23	23.00	0.00
instance n=100 455.alb	1	1	Optimal	22.69	23	23.00	0.00
instance n=100 456.alb	1	1	Optimal	29.58	26	26.00	0.00
instance n=100 457.alb	1	1	Optimal	10.00	23	23.00	0.00
instance n=100 458.alb	1	1	Optimal	20.45	24	24.00	0.00
instance n=100 459.alb	1	1	Solution	30.06	23	23.00	0.00
instance n=100 46.alb	1	1	Solution	30.06	14	14.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 460.alb	1	1	Optimal	12.58	23	23.00	0.00
instance n=100 461.alb	1	1	Solution	30.06	23	23.00	0.00
instance n=100 462.alb	1	1	Optimal	22.09	23	23.00	0.00
instance n=100 463.alb	1	1	Optimal	20.40	26	26.00	0.00
instance n=100 464.alb	1	1	Optimal	21.73	25	25.00	0.00
instance n=100 465.alb	1	1	Optimal	21.64	22	22.00	0.00
instance n=100 466.alb	1	1	Optimal	22.04	26	26.00	0.00
instance n=100 467.alb	1	1	Solution	30.09	21	21.00	0.00
instance n=100 468.alb	1	1	Optimal	23.22	25	25.00	0.00
instance n=100 469.alb	1	1	Optimal	20.94	22	22.00	0.00
instance n=100 47.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 470.alb	1	1	Optimal	22.66	26	26.00	0.00
instance n=100 471.alb	1	1	Solution	30.07	26	26.00	0.00
instance n=100 472.alb	1	1	Optimal	16.32	23	23.00	0.00
instance n=100 473.alb	1	1	Solution	30.06	28	28.00	0.00
instance n=100 474.alb	1	1	Optimal	12.83	23	23.00	0.00
instance n=100 475.alb	1	1	Optimal	26.16	24	24.00	0.00
instance n=100 476.alb	1	1	Optimal	11.58	14	14.00	0.00
instance n=100 477.alb	1	1	Optimal	12.60	14	14.00	0.00
instance n=100 478.alb	1	1	Optimal	6.94	14	14.00	0.00
instance n=100 479.alb	1	1	Optimal	3.26	16	16.00	0.00
instance n=100 48.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=100 480.alb	1	1	Optimal	3.98	15	15.00	0.00
instance n=100 481.alb	1	1	Optimal	11.57	15	15.00	0.00
instance n=100 482.alb	1	1	Optimal	3.29	15	15.00	0.00
instance n=100 483.alb	1	1	Optimal	7.81	14	14.00	0.00
instance n=100 484.alb	1	1	Optimal	14.42	14	14.00	0.00
instance n=100 485.alb	1	1	Optimal	1.85	16	16.00	0.00
instance n=100 486.alb	1	1	Optimal	10.33	15	15.00	0.00
instance n=100 487.alb	1	1	Optimal	5.63	15	15.00	0.00
instance n=100 488.alb	1	1	Optimal	5.14	16	16.00	0.00
instance n=100 489.alb	1	1	Optimal	4.94	13	13.00	0.00
instance n=100 49.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=100 490.alb	1	1	Optimal	4.22	15	15.00	0.00
instance n=100 491.alb	1	1	Optimal	2.93	16	16.00	0.00
instance n=100 492.alb	1	1	Optimal	4.11	14	14.00	0.00
instance n=100 493.alb	1	1	Optimal	12.13	14	14.00	0.00
instance n=100 494.alb	1	1	Optimal	7.10	14	14.00	0.00
instance n=100 495.alb	1	1	Optimal	9.03	15	15.00	0.00
instance n=100 496.alb	1	1	Optimal	4.54	14	14.00	0.00
instance n=100 497.alb	1	1	Optimal	4.56	13	13.00	0.00
instance n=100 498.alb	1	1	Optimal	4.81	14	14.00	0.00
instance n=100 499.alb	1	1	Optimal	19.38	14	14.00	0.00
instance n=100 5.alb	1	1	Solution	30.09	22	22.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 50.alb	1	1	Solution	30.04	14	14.00	0.00
instance n=100 500.alb	1	1	Optimal	23.18	14	14.00	0.00
instance n=100 501.alb	1	1	Solution	30.07	63	55.00	12.70
instance n=100 502.alb	1	1	Solution	30.08	64	55.00	14.06
instance n=100 503.alb	1	1	Solution	30.06	61	53.00	13.11
instance n=100 504.alb	1	1	Solution	30.04	60	54.00	10.00
instance n=100 505.alb	1	1	Solution	30.06	61	52.00	14.75
instance n=100 506.alb	1	1	Solution	30.07	58	52.00	10.34
instance n=100 507.alb	1	1	Solution	30.05	59	52.00	11.86
instance n=100 508.alb	1	1	Solution	30.09	56	52.00	7.14
instance n=100 509.alb	1	1	Solution	30.05	58	53.00	8.62
instance n=100 51.alb	1	1	Solution	30.09	50	48.00	4.00
instance n=100 510.alb	1	1	Solution	30.05	58	53.00	8.62
instance n=100 511.alb	1	1	Solution	30.08	60	53.00	11.67
instance n=100 512.alb	1	1	Solution	30.05	60	54.00	10.00
instance n=100 513.alb	1	1	Solution	30.09	62	52.00	16.13
instance n=100 514.alb	1	1	Solution	30.08	58	52.00	10.34
instance n=100 515.alb	1	1	Solution	30.07	62	53.00	14.52
instance n=100 516.alb	1	1	Solution	30.05	70	56.00	20.00
instance n=100 517.alb	1	1	Solution	30.06	62	54.00	12.90
instance n=100 518.alb	1	1	Solution	30.08	57	51.00	10.53
instance n=100 519.alb	1	1	Solution	30.03	61	54.00	11.48
instance n=100 52.alb	1	1	Solution	30.07	53	50.00	5.66
instance n=100 520.alb	1	1	Solution	30.05	60	53.00	11.67
instance n=100 521.alb	1	1	Solution	30.08	70	57.00	18.57
instance n=100 522.alb	1	1	Solution	30.07	59	52.00	11.86
instance n=100 523.alb	1	1	Solution	30.02	55	51.00	7.27
instance n=100 524.alb	1	1	Solution	30.06	59	52.00	11.86
instance n=100 525.alb	1	1	Solution	30.08	62	52.00	16.13
instance n=100 53.alb	1	1	Solution	30.06	52	50.00	3.85
instance n=100 54.alb	1	1	Solution	30.06	51	49.00	3.92
instance n=100 55.alb	1	1	Solution	30.08	53	50.00	5.66
instance n=100 56.alb	1	1	Solution	30.08	52	50.00	3.85
instance n=100 57.alb	1	1	Solution	30.06	55	51.00	7.27
instance n=100 58.alb	1	1	Solution	30.04	57	52.00	8.77
instance n=100 59.alb	1	1	Solution	30.07	58	51.00	12.07
instance n=100 6.alb	1	1	Solution	30.08	22	22.00	0.00
instance n=100 60.alb	1	1	Solution	30.03	54	51.00	5.56
instance n=100 61.alb	1	1	Solution	30.06	56	51.00	8.93
instance n=100 62.alb	1	1	Solution	30.06	52	49.00	5.77
instance n=100 63.alb	1	1	Solution	30.07	61	52.00	14.75
instance n=100 64.alb	1	1	Solution	30.06	56	51.00	8.93
instance n=100 65.alb	1	1	Solution	30.09	62	53.00	14.52
instance n=100 66.alb	1	1	Solution	30.06	51	49.00	3.92

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 67.alb	1	1	Solution	30.10	55	51.00	7.27
instance n=100 68.alb	1	1	Solution	30.07	57	49.00	14.04
instance n=100 69.alb	1	1	Solution	30.05	53	51.00	3.77
instance n=100 7.alb	1	1	Solution	30.07	26	26.00	0.00
instance n=100 70.alb	1	1	Solution	30.07	54	50.00	7.41
instance n=100 71.alb	1	1	Solution	30.07	53	50.00	5.66
instance n=100 72.alb	1	1	Solution	30.07	54	50.00	7.41
instance n=100 73.alb	1	1	Solution	30.05	56	52.00	7.14
instance n=100 74.alb	1	1	Solution	30.06	52	49.00	5.77
instance n=100 75.alb	1	1	Solution	30.06	55	51.00	7.27
instance n=100 76.alb	1	1	Solution	30.05	23	23.00	0.00
instance n=100 77.alb	1	1	Solution	30.06	20	20.00	0.00
instance n=100 78.alb	1	1	Solution	30.06	21	21.00	0.00
instance n=100 79.alb	1	1	Solution	30.06	21	21.00	0.00
instance n=100 8.alb	1	1	Solution	30.05	24	24.00	0.00
instance n=100 80.alb	1	1	Solution	30.07	22	22.00	0.00
instance n=100 81.alb	1	1	Solution	30.03	20	20.00	0.00
instance n=100 82.alb	1	1	Solution	30.08	21	21.00	0.00
instance n=100 83.alb	1	1	Solution	30.07	22	22.00	0.00
instance n=100 84.alb	1	1	Solution	30.03	27	26.00	3.70
instance n=100 85.alb	1	1	Solution	30.02	25	24.00	4.00
instance n=100 86.alb	1	1	Solution	30.08	23	23.00	0.00
instance n=100 87.alb	1	1	Solution	30.05	22	22.00	0.00
instance n=100 88.alb	1	1	Solution	30.08	24	23.00	4.17
instance n=100 89.alb	1	1	Solution	30.07	24	24.00	0.00
instance n=100 9.alb	1	1	Solution	30.08	23	23.00	0.00
instance n=100 90.alb	1	1	Solution	30.08	21	20.00	4.76
instance n=100 91.alb	1	1	Solution	30.05	25	25.00	0.00
instance n=100 92.alb	1	1	Solution	30.07	24	24.00	0.00
instance n=100 93.alb	1	1	Solution	30.06	27	27.00	0.00
instance n=100 94.alb	1	1	Solution	30.04	23	22.00	4.35
instance n=100 95.alb	1	1	Solution	30.06	21	21.00	0.00
instance n=100 96.alb	1	1	Solution	30.08	21	21.00	0.00
instance n=100 97.alb	1	1	Solution	30.09	22	22.00	0.00
instance n=100 98.alb	1	1	Solution	30.04	22	22.00	0.00
instance n=100 99.alb	1	1	Solution	30.05	22	22.00	0.00
instance n=20 1.alb	1	1	Optimal	0.57	3	3.00	0.00
instance n=20 10.alb	1	1	Optimal	0.18	3	3.00	0.00
instance n=20 100.alb	1	1	Optimal	0.90	11	11.00	0.00
instance n=20 101.alb	1	1	Optimal	2.09	13	13.00	0.00
instance n=20 102.alb	1	1	Optimal	0.77	13	13.00	0.00
instance n=20 103.alb	1	1	Optimal	0.30	12	12.00	0.00
instance n=20 104.alb	1	1	Optimal	0.35	11	11.00	0.00
instance n=20 105.alb	1	1	Optimal	0.54	12	12.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 106.alb	1	1	Optimal	0.14	10	10.00	0.00
instance n=20 107.alb	1	1	Optimal	1.76	14	14.00	0.00
instance n=20 108.alb	1	1	Optimal	4.59	15	15.00	0.00
instance n=20 109.alb	1	1	Optimal	0.42	12	12.00	0.00
instance n=20 11.alb	1	1	Optimal	0.04	3	3.00	0.00
instance n=20 110.alb	1	1	Optimal	0.28	11	11.00	0.00
instance n=20 111.alb	1	1	Optimal	0.60	13	13.00	0.00
instance n=20 112.alb	1	1	Optimal	0.17	11	11.00	0.00
instance n=20 113.alb	1	1	Optimal	0.65	12	12.00	0.00
instance n=20 114.alb	1	1	Optimal	0.66	13	13.00	0.00
instance n=20 115.alb	1	1	Optimal	0.36	11	11.00	0.00
instance n=20 116.alb	1	1	Optimal	0.14	5	5.00	0.00
instance n=20 117.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 118.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 119.alb	1	1	Optimal	0.11	6	6.00	0.00
instance n=20 12.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 120.alb	1	1	Optimal	0.18	6	6.00	0.00
instance n=20 121.alb	1	1	Optimal	0.29	5	5.00	0.00
instance n=20 122.alb	1	1	Optimal	0.15	6	6.00	0.00
instance n=20 123.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 124.alb	1	1	Optimal	0.06	5	5.00	0.00
instance n=20 125.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 126.alb	1	1	Optimal	0.09	5	5.00	0.00
instance n=20 127.alb	1	1	Optimal	0.12	4	4.00	0.00
instance n=20 128.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 129.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 13.alb	1	1	Optimal	0.63	3	3.00	0.00
instance n=20 130.alb	1	1	Optimal	0.25	6	6.00	0.00
instance n=20 131.alb	1	1	Optimal	0.14	7	7.00	0.00
instance n=20 132.alb	1	1	Optimal	0.16	4	4.00	0.00
instance n=20 133.alb	1	1	Optimal	0.17	5	5.00	0.00
instance n=20 134.alb	1	1	Optimal	0.12	6	6.00	0.00
instance n=20 135.alb	1	1	Optimal	0.02	6	6.00	0.00
instance n=20 136.alb	1	1	Optimal	0.13	6	6.00	0.00
instance n=20 137.alb	1	1	Optimal	0.10	5	5.00	0.00
instance n=20 138.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 139.alb	1	1	Optimal	0.16	5	5.00	0.00
instance n=20 14.alb	1	1	Optimal	0.53	3	3.00	0.00
instance n=20 140.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 141.alb	1	1	Optimal	0.49	3	3.00	0.00
instance n=20 142.alb	1	1	Optimal	0.42	3	3.00	0.00
instance n=20 143.alb	1	1	Optimal	0.16	3	3.00	0.00
instance n=20 144.alb	1	1	Optimal	0.27	4	4.00	0.00
instance n=20 145.alb	1	1	Optimal	0.41	3	3.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 146.alb	1	1	Optimal	0.40	3	3.00	0.00
instance n=20 147.alb	1	1	Optimal	0.43	3	3.00	0.00
instance n=20 148.alb	1	1	Optimal	0.51	3	3.00	0.00
instance n=20 149.alb	1	1	Optimal	0.50	3	3.00	0.00
instance n=20 15.alb	1	1	Optimal	0.02	3	3.00	0.00
instance n=20 150.alb	1	1	Optimal	0.49	3	3.00	0.00
instance n=20 151.alb	1	1	Optimal	0.42	3	3.00	0.00
instance n=20 152.alb	1	1	Optimal	0.14	3	3.00	0.00
instance n=20 153.alb	1	1	Optimal	0.41	3	3.00	0.00
instance n=20 154.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 155.alb	1	1	Optimal	0.52	3	3.00	0.00
instance n=20 156.alb	1	1	Optimal	0.13	3	3.00	0.00
instance n=20 157.alb	1	1	Optimal	0.13	3	3.00	0.00
instance n=20 158.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 159.alb	1	1	Optimal	0.27	3	3.00	0.00
instance n=20 16.alb	1	1	Optimal	1.02	12	12.00	0.00
instance n=20 160.alb	1	1	Optimal	0.49	3	3.00	0.00
instance n=20 161.alb	1	1	Optimal	0.52	3	3.00	0.00
instance n=20 162.alb	1	1	Optimal	0.38	3	3.00	0.00
instance n=20 163.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 164.alb	1	1	Optimal	0.24	4	4.00	0.00
instance n=20 165.alb	1	1	Optimal	0.02	3	3.00	0.00
instance n=20 166.alb	1	1	Optimal	3.08	12	12.00	0.00
instance n=20 167.alb	1	1	Optimal	0.56	11	11.00	0.00
instance n=20 168.alb	1	1	Optimal	0.69	10	10.00	0.00
instance n=20 169.alb	1	1	Optimal	1.79	11	11.00	0.00
instance n=20 17.alb	1	1	Optimal	0.96	10	10.00	0.00
instance n=20 170.alb	1	1	Optimal	3.03	11	11.00	0.00
instance n=20 171.alb	1	1	Solution	30.02	13	11.00	15.38
instance n=20 172.alb	1	1	Optimal	0.62	11	11.00	0.00
instance n=20 173.alb	1	1	Optimal	1.18	11	11.00	0.00
instance n=20 174.alb	1	1	Optimal	0.99	12	12.00	0.00
instance n=20 175.alb	1	1	Optimal	0.25	10	10.00	0.00
instance n=20 176.alb	1	1	Optimal	0.49	11	11.00	0.00
instance n=20 177.alb	1	1	Optimal	0.70	10	10.00	0.00
instance n=20 178.alb	1	1	Optimal	0.97	11	11.00	0.00
instance n=20 179.alb	1	1	Optimal	1.04	11	11.00	0.00
instance n=20 18.alb	1	1	Optimal	1.41	11	11.00	0.00
instance n=20 180.alb	1	1	Optimal	26.38	13	13.00	0.00
instance n=20 181.alb	1	1	Optimal	0.57	11	11.00	0.00
instance n=20 182.alb	1	1	Optimal	0.99	11	11.00	0.00
instance n=20 183.alb	1	1	Optimal	26.95	13	13.00	0.00
instance n=20 184.alb	1	1	Optimal	1.72	12	12.00	0.00
instance n=20 185.alb	1	1	Solution	30.01	15	13.00	13.33

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 186.alb	1	1	Optimal	15.38	14	14.00	0.00
instance n=20 187.alb	1	1	Optimal	0.35	10	10.00	0.00
instance n=20 188.alb	1	1	Optimal	1.27	11	11.00	0.00
instance n=20 189.alb	1	1	Optimal	5.40	13	13.00	0.00
instance n=20 19.alb	1	1	Solution	30.01	14	12.00	14.29
instance n=20 190.alb	1	1	Solution	30.01	15	12.00	20.00
instance n=20 191.alb	1	1	Optimal	0.55	4	4.00	0.00
instance n=20 192.alb	1	1	Optimal	0.18	5	5.00	0.00
instance n=20 193.alb	1	1	Optimal	0.36	5	5.00	0.00
instance n=20 194.alb	1	1	Optimal	0.23	6	6.00	0.00
instance n=20 195.alb	1	1	Optimal	0.02	6	6.00	0.00
instance n=20 196.alb	1	1	Optimal	0.23	5	5.00	0.00
instance n=20 197.alb	1	1	Optimal	0.26	4	4.00	0.00
instance n=20 198.alb	1	1	Optimal	0.17	6	6.00	0.00
instance n=20 199.alb	1	1	Optimal	0.31	5	5.00	0.00
instance n=20 2.alb	1	1	Optimal	0.29	3	3.00	0.00
instance n=20 20.alb	1	1	Optimal	1.37	11	11.00	0.00
instance n=20 200.alb	1	1	Optimal	0.17	6	6.00	0.00
instance n=20 201.alb	1	1	Optimal	0.31	6	6.00	0.00
instance n=20 202.alb	1	1	Optimal	0.32	4	4.00	0.00
instance n=20 203.alb	1	1	Optimal	0.27	4	4.00	0.00
instance n=20 204.alb	1	1	Optimal	0.44	5	5.00	0.00
instance n=20 205.alb	1	1	Optimal	0.28	6	6.00	0.00
instance n=20 206.alb	1	1	Optimal	0.17	5	5.00	0.00
instance n=20 207.alb	1	1	Optimal	0.27	6	6.00	0.00
instance n=20 208.alb	1	1	Optimal	0.47	5	5.00	0.00
instance n=20 209.alb	1	1	Optimal	0.31	4	4.00	0.00
instance n=20 21.alb	1	1	Optimal	4.15	14	14.00	0.00
instance n=20 210.alb	1	1	Optimal	0.31	5	5.00	0.00
instance n=20 211.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 212.alb	1	1	Optimal	0.19	5	5.00	0.00
instance n=20 213.alb	1	1	Optimal	0.14	5	5.00	0.00
instance n=20 214.alb	1	1	Optimal	0.40	5	5.00	0.00
instance n=20 215.alb	1	1	Optimal	0.40	5	5.00	0.00
instance n=20 216.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 217.alb	1	1	Optimal	0.11	4	4.00	0.00
instance n=20 218.alb	1	1	Optimal	0.13	3	3.00	0.00
instance n=20 219.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 22.alb	1	1	Optimal	0.65	12	12.00	0.00
instance n=20 220.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 221.alb	1	1	Optimal	0.07	3	3.00	0.00
instance n=20 222.alb	1	1	Optimal	0.05	3	3.00	0.00
instance n=20 223.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 224.alb	1	1	Optimal	0.11	3	3.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 225.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 226.alb	1	1	Optimal	0.31	3	3.00	0.00
instance n=20 227.alb	1	1	Optimal	0.20	3	3.00	0.00
instance n=20 228.alb	1	1	Optimal	0.06	2	2.00	0.00
instance n=20 229.alb	1	1	Optimal	0.20	3	3.00	0.00
instance n=20 23.alb	1	1	Optimal	25.07	13	13.00	0.00
instance n=20 230.alb	1	1	Optimal	0.09	3	3.00	0.00
instance n=20 231.alb	1	1	Optimal	0.09	3	3.00	0.00
instance n=20 232.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 233.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 234.alb	1	1	Optimal	0.04	3	3.00	0.00
instance n=20 235.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 236.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 237.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 238.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 239.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 24.alb	1	1	Optimal	3.99	11	11.00	0.00
instance n=20 240.alb	1	1	Optimal	0.09	3	3.00	0.00
instance n=20 241.alb	1	1	Optimal	0.34	13	13.00	0.00
instance n=20 242.alb	1	1	Optimal	0.13	12	12.00	0.00
instance n=20 243.alb	1	1	Optimal	0.21	10	10.00	0.00
instance n=20 244.alb	1	1	Optimal	0.11	11	11.00	0.00
instance n=20 245.alb	1	1	Optimal	0.32	13	13.00	0.00
instance n=20 246.alb	1	1	Optimal	0.61	13	13.00	0.00
instance n=20 247.alb	1	1	Optimal	0.30	11	11.00	0.00
instance n=20 248.alb	1	1	Optimal	0.22	11	11.00	0.00
instance n=20 249.alb	1	1	Optimal	0.61	13	13.00	0.00
instance n=20 25.alb	1	1	Optimal	0.17	11	11.00	0.00
instance n=20 250.alb	1	1	Optimal	0.22	10	10.00	0.00
instance n=20 251.alb	1	1	Optimal	0.25	12	12.00	0.00
instance n=20 252.alb	1	1	Optimal	0.28	11	11.00	0.00
instance n=20 253.alb	1	1	Optimal	0.44	13	13.00	0.00
instance n=20 254.alb	1	1	Optimal	0.23	12	12.00	0.00
instance n=20 255.alb	1	1	Optimal	0.53	13	13.00	0.00
instance n=20 256.alb	1	1	Optimal	0.36	14	14.00	0.00
instance n=20 257.alb	1	1	Optimal	0.09	10	10.00	0.00
instance n=20 258.alb	1	1	Optimal	0.25	13	13.00	0.00
instance n=20 259.alb	1	1	Optimal	0.51	13	13.00	0.00
instance n=20 26.alb	1	1	Optimal	1.16	12	12.00	0.00
instance n=20 260.alb	1	1	Optimal	0.63	12	12.00	0.00
instance n=20 261.alb	1	1	Optimal	0.16	12	12.00	0.00
instance n=20 262.alb	1	1	Optimal	0.11	11	11.00	0.00
instance n=20 263.alb	1	1	Optimal	0.31	12	12.00	0.00
instance n=20 264.alb	1	1	Optimal	0.38	12	12.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 265.alb	1	1	Optimal	0.25	12	12.00	0.00
instance n=20 266.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 267.alb	1	1	Optimal	0.11	6	6.00	0.00
instance n=20 268.alb	1	1	Optimal	0.06	6	6.00	0.00
instance n=20 269.alb	1	1	Optimal	0.18	7	7.00	0.00
instance n=20 27.alb	1	1	Optimal	8.56	13	13.00	0.00
instance n=20 270.alb	1	1	Optimal	0.09	7	7.00	0.00
instance n=20 271.alb	1	1	Optimal	0.05	6	6.00	0.00
instance n=20 272.alb	1	1	Optimal	0.15	5	5.00	0.00
instance n=20 273.alb	1	1	Optimal	0.07	5	5.00	0.00
instance n=20 274.alb	1	1	Optimal	0.12	6	6.00	0.00
instance n=20 275.alb	1	1	Optimal	0.10	5	5.00	0.00
instance n=20 276.alb	1	1	Optimal	0.11	4	4.00	0.00
instance n=20 277.alb	1	1	Optimal	0.11	4	4.00	0.00
instance n=20 278.alb	1	1	Optimal	0.14	6	6.00	0.00
instance n=20 279.alb	1	1	Optimal	0.13	6	6.00	0.00
instance n=20 28.alb	1	1	Optimal	2.66	12	12.00	0.00
instance n=20 280.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 281.alb	1	1	Optimal	0.17	4	4.00	0.00
instance n=20 282.alb	1	1	Optimal	0.07	4	4.00	0.00
instance n=20 283.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 284.alb	1	1	Optimal	0.15	5	5.00	0.00
instance n=20 285.alb	1	1	Optimal	0.20	5	5.00	0.00
instance n=20 286.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 287.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 288.alb	1	1	Optimal	0.06	6	6.00	0.00
instance n=20 289.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 29.alb	1	1	Optimal	0.35	10	10.00	0.00
instance n=20 290.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 291.alb	1	1	Optimal	0.27	3	3.00	0.00
instance n=20 292.alb	1	1	Optimal	0.02	3	3.00	0.00
instance n=20 293.alb	1	1	Optimal	0.03	3	3.00	0.00
instance n=20 294.alb	1	1	Optimal	0.03	3	3.00	0.00
instance n=20 295.alb	1	1	Optimal	0.39	3	3.00	0.00
instance n=20 296.alb	1	1	Optimal	0.09	3	3.00	0.00
instance n=20 297.alb	1	1	Optimal	0.25	3	3.00	0.00
instance n=20 298.alb	1	1	Optimal	0.03	3	3.00	0.00
instance n=20 299.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 3.alb	1	1	Optimal	0.03	3	3.00	0.00
instance n=20 30.alb	1	1	Solution	30.00	16	15.00	6.25
instance n=20 300.alb	1	1	Optimal	0.44	4	4.00	0.00
instance n=20 301.alb	1	1	Optimal	0.02	3	3.00	0.00
instance n=20 302.alb	1	1	Optimal	0.15	3	3.00	0.00
instance n=20 303.alb	1	1	Optimal	0.03	3	3.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 304.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 305.alb	1	1	Optimal	0.03	3	3.00	0.00
instance n=20 306.alb	1	1	Optimal	0.60	3	3.00	0.00
instance n=20 307.alb	1	1	Optimal	0.15	3	3.00	0.00
instance n=20 308.alb	1	1	Optimal	0.02	3	3.00	0.00
instance n=20 309.alb	1	1	Optimal	0.58	3	3.00	0.00
instance n=20 31.alb	1	1	Optimal	2.93	12	12.00	0.00
instance n=20 310.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 311.alb	1	1	Optimal	0.03	3	3.00	0.00
instance n=20 312.alb	1	1	Optimal	0.27	4	4.00	0.00
instance n=20 313.alb	1	1	Optimal	0.27	3	3.00	0.00
instance n=20 314.alb	1	1	Optimal	0.46	3	3.00	0.00
instance n=20 315.alb	1	1	Optimal	0.05	3	3.00	0.00
instance n=20 316.alb	1	1	Optimal	6.80	10	10.00	0.00
instance n=20 317.alb	1	1	Optimal	2.05	10	10.00	0.00
instance n=20 318.alb	1	1	Optimal	0.33	10	10.00	0.00
instance n=20 319.alb	1	1	Optimal	7.02	14	14.00	0.00
instance n=20 32.alb	1	1	Optimal	16.69	13	13.00	0.00
instance n=20 320.alb	1	1	Optimal	1.18	12	12.00	0.00
instance n=20 321.alb	1	1	Solution	30.02	14	11.00	21.43
instance n=20 322.alb	1	1	Optimal	13.95	12	12.00	0.00
instance n=20 323.alb	1	1	Optimal	8.34	13	13.00	0.00
instance n=20 324.alb	1	1	Optimal	0.92	9	9.00	0.00
instance n=20 325.alb	1	1	Solution	30.02	14	11.00	21.43
instance n=20 326.alb	1	1	Solution	30.01	14	12.00	14.29
instance n=20 327.alb	1	1	Optimal	12.76	13	13.00	0.00
instance n=20 328.alb	1	1	Optimal	16.39	13	13.00	0.00
instance n=20 329.alb	1	1	Optimal	1.26	10	10.00	0.00
instance n=20 33.alb	1	1	Optimal	0.81	11	11.00	0.00
instance n=20 330.alb	1	1	Solution	30.01	12	11.00	8.33
instance n=20 331.alb	1	1	Solution	30.02	13	12.00	7.69
instance n=20 332.alb	1	1	Optimal	11.17	13	13.00	0.00
instance n=20 333.alb	1	1	Optimal	1.56	11	11.00	0.00
instance n=20 334.alb	1	1	Optimal	0.73	10	10.00	0.00
instance n=20 335.alb	1	1	Solution	30.02	14	11.00	21.43
instance n=20 336.alb	1	1	Optimal	1.02	11	11.00	0.00
instance n=20 337.alb	1	1	Optimal	0.22	10	10.00	0.00
instance n=20 338.alb	1	1	Optimal	14.56	14	14.00	0.00
instance n=20 339.alb	1	1	Optimal	20.55	13	13.00	0.00
instance n=20 34.alb	1	1	Optimal	2.53	12	12.00	0.00
instance n=20 340.alb	1	1	Optimal	0.68	11	11.00	0.00
instance n=20 341.alb	1	1	Optimal	0.11	6	6.00	0.00
instance n=20 342.alb	1	1	Optimal	0.35	6	6.00	0.00
instance n=20 343.alb	1	1	Optimal	0.22	6	6.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 344.alb	1	1	Optimal	0.36	6	6.00	0.00
instance n=20 345.alb	1	1	Optimal	0.53	4	4.00	0.00
instance n=20 346.alb	1	1	Optimal	0.28	5	5.00	0.00
instance n=20 347.alb	1	1	Optimal	0.41	6	6.00	0.00
instance n=20 348.alb	1	1	Optimal	0.21	5	5.00	0.00
instance n=20 349.alb	1	1	Optimal	0.52	5	5.00	0.00
instance n=20 35.alb	1	1	Optimal	1.60	12	12.00	0.00
instance n=20 350.alb	1	1	Optimal	0.49	5	5.00	0.00
instance n=20 351.alb	1	1	Optimal	0.15	5	5.00	0.00
instance n=20 352.alb	1	1	Optimal	0.60	4	4.00	0.00
instance n=20 353.alb	1	1	Optimal	0.24	6	6.00	0.00
instance n=20 354.alb	1	1	Optimal	0.33	6	6.00	0.00
instance n=20 355.alb	1	1	Optimal	0.23	5	5.00	0.00
instance n=20 356.alb	1	1	Optimal	0.36	5	5.00	0.00
instance n=20 357.alb	1	1	Optimal	0.81	5	5.00	0.00
instance n=20 358.alb	1	1	Optimal	0.27	4	4.00	0.00
instance n=20 359.alb	1	1	Optimal	0.35	4	4.00	0.00
instance n=20 36.alb	1	1	Optimal	1.84	13	13.00	0.00
instance n=20 360.alb	1	1	Optimal	0.37	6	6.00	0.00
instance n=20 361.alb	1	1	Optimal	0.43	5	5.00	0.00
instance n=20 362.alb	1	1	Optimal	0.34	5	5.00	0.00
instance n=20 363.alb	1	1	Optimal	0.42	7	7.00	0.00
instance n=20 364.alb	1	1	Optimal	0.33	4	4.00	0.00
instance n=20 365.alb	1	1	Optimal	0.50	5	5.00	0.00
instance n=20 366.alb	1	1	Optimal	0.19	3	3.00	0.00
instance n=20 367.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 368.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 369.alb	1	1	Optimal	0.24	3	3.00	0.00
instance n=20 37.alb	1	1	Optimal	3.38	12	12.00	0.00
instance n=20 370.alb	1	1	Optimal	0.02	3	3.00	0.00
instance n=20 371.alb	1	1	Optimal	0.18	3	3.00	0.00
instance n=20 372.alb	1	1	Optimal	0.15	3	3.00	0.00
instance n=20 373.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 374.alb	1	1	Optimal	0.07	3	3.00	0.00
instance n=20 375.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 376.alb	1	1	Optimal	0.16	3	3.00	0.00
instance n=20 377.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 378.alb	1	1	Optimal	0.02	3	3.00	0.00
instance n=20 379.alb	1	1	Optimal	0.07	4	4.00	0.00
instance n=20 38.alb	1	1	Optimal	0.50	12	12.00	0.00
instance n=20 380.alb	1	1	Optimal	0.22	3	3.00	0.00
instance n=20 381.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 382.alb	1	1	Optimal	0.18	4	4.00	0.00
instance n=20 383.alb	1	1	Optimal	0.11	3	3.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 384.alb	1	1	Optimal	0.22	3	3.00	0.00
instance n=20 385.alb	1	1	Optimal	0.24	3	3.00	0.00
instance n=20 386.alb	1	1	Optimal	0.19	3	3.00	0.00
instance n=20 387.alb	1	1	Optimal	0.32	3	3.00	0.00
instance n=20 388.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 389.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 39.alb	1	1	Optimal	6.26	13	13.00	0.00
instance n=20 390.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 391.alb	1	1	Optimal	0.27	11	11.00	0.00
instance n=20 392.alb	1	1	Optimal	0.40	14	14.00	0.00
instance n=20 393.alb	1	1	Optimal	0.26	11	11.00	0.00
instance n=20 394.alb	1	1	Optimal	0.32	12	12.00	0.00
instance n=20 395.alb	1	1	Optimal	0.23	12	12.00	0.00
instance n=20 396.alb	1	1	Optimal	0.36	13	13.00	0.00
instance n=20 397.alb	1	1	Optimal	0.23	10	10.00	0.00
instance n=20 398.alb	1	1	Optimal	0.19	11	11.00	0.00
instance n=20 399.alb	1	1	Optimal	0.45	13	13.00	0.00
instance n=20 4.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 40.alb	1	1	Optimal	1.03	12	12.00	0.00
instance n=20 400.alb	1	1	Optimal	0.45	12	12.00	0.00
instance n=20 401.alb	1	1	Optimal	0.25	12	12.00	0.00
instance n=20 402.alb	1	1	Optimal	0.33	12	12.00	0.00
instance n=20 403.alb	1	1	Optimal	0.27	12	12.00	0.00
instance n=20 404.alb	1	1	Optimal	0.18	10	10.00	0.00
instance n=20 405.alb	1	1	Optimal	0.19	12	12.00	0.00
instance n=20 406.alb	1	1	Optimal	1.43	14	14.00	0.00
instance n=20 407.alb	1	1	Optimal	0.16	10	10.00	0.00
instance n=20 408.alb	1	1	Optimal	1.19	14	14.00	0.00
instance n=20 409.alb	1	1	Optimal	0.33	12	12.00	0.00
instance n=20 41.alb	1	1	Optimal	0.23	6	6.00	0.00
instance n=20 410.alb	1	1	Optimal	0.34	11	11.00	0.00
instance n=20 411.alb	1	1	Optimal	1.36	15	15.00	0.00
instance n=20 412.alb	1	1	Optimal	0.22	11	11.00	0.00
instance n=20 413.alb	1	1	Optimal	0.19	10	10.00	0.00
instance n=20 414.alb	1	1	Optimal	0.41	12	12.00	0.00
instance n=20 415.alb	1	1	Optimal	0.21	10	10.00	0.00
instance n=20 416.alb	1	1	Optimal	0.08	6	6.00	0.00
instance n=20 417.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 418.alb	1	1	Optimal	0.05	6	6.00	0.00
instance n=20 419.alb	1	1	Optimal	0.16	4	4.00	0.00
instance n=20 42.alb	1	1	Optimal	0.38	5	5.00	0.00
instance n=20 420.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 421.alb	1	1	Optimal	0.15	6	6.00	0.00
instance n=20 422.alb	1	1	Optimal	0.16	4	4.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 423.alb	1	1	Optimal	0.16	6	6.00	0.00
instance n=20 424.alb	1	1	Optimal	0.14	5	5.00	0.00
instance n=20 425.alb	1	1	Optimal	0.07	6	6.00	0.00
instance n=20 426.alb	1	1	Optimal	0.14	5	5.00	0.00
instance n=20 427.alb	1	1	Optimal	0.12	6	6.00	0.00
instance n=20 428.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 429.alb	1	1	Optimal	0.13	4	4.00	0.00
instance n=20 43.alb	1	1	Optimal	0.24	5	5.00	0.00
instance n=20 430.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 431.alb	1	1	Optimal	0.08	6	6.00	0.00
instance n=20 432.alb	1	1	Optimal	0.06	5	5.00	0.00
instance n=20 433.alb	1	1	Optimal	0.14	5	5.00	0.00
instance n=20 434.alb	1	1	Optimal	0.14	5	5.00	0.00
instance n=20 435.alb	1	1	Optimal	0.18	7	7.00	0.00
instance n=20 436.alb	1	1	Optimal	0.10	5	5.00	0.00
instance n=20 437.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 438.alb	1	1	Optimal	0.11	6	6.00	0.00
instance n=20 439.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 44.alb	1	1	Optimal	0.33	5	5.00	0.00
instance n=20 440.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 441.alb	1	1	Optimal	0.03	3	3.00	0.00
instance n=20 442.alb	1	1	Optimal	0.07	3	3.00	0.00
instance n=20 443.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 444.alb	1	1	Optimal	0.05	3	3.00	0.00
instance n=20 445.alb	1	1	Optimal	0.07	3	3.00	0.00
instance n=20 446.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 447.alb	1	1	Optimal	0.05	3	3.00	0.00
instance n=20 448.alb	1	1	Optimal	0.07	3	3.00	0.00
instance n=20 449.alb	1	1	Optimal	0.05	3	3.00	0.00
instance n=20 45.alb	1	1	Optimal	0.18	6	6.00	0.00
instance n=20 450.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 451.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 452.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 453.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 454.alb	1	1	Optimal	0.05	3	3.00	0.00
instance n=20 455.alb	1	1	Optimal	0.05	3	3.00	0.00
instance n=20 456.alb	1	1	Optimal	0.08	4	4.00	0.00
instance n=20 457.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 458.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 459.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 46.alb	1	1	Optimal	0.33	4	4.00	0.00
instance n=20 460.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 461.alb	1	1	Optimal	0.07	3	3.00	0.00
instance n=20 462.alb	1	1	Optimal	0.06	3	3.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 463.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 464.alb	1	1	Optimal	0.07	3	3.00	0.00
instance n=20 465.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 466.alb	1	1	Optimal	0.08	13	13.00	0.00
instance n=20 467.alb	1	1	Optimal	0.13	14	14.00	0.00
instance n=20 468.alb	1	1	Optimal	0.13	13	13.00	0.00
instance n=20 469.alb	1	1	Optimal	0.12	14	14.00	0.00
instance n=20 47.alb	1	1	Optimal	0.26	4	4.00	0.00
instance n=20 470.alb	1	1	Optimal	0.12	12	12.00	0.00
instance n=20 471.alb	1	1	Optimal	0.06	12	12.00	0.00
instance n=20 472.alb	1	1	Optimal	0.12	13	13.00	0.00
instance n=20 473.alb	1	1	Optimal	0.09	10	10.00	0.00
instance n=20 474.alb	1	1	Optimal	0.13	14	14.00	0.00
instance n=20 475.alb	1	1	Optimal	0.06	11	11.00	0.00
instance n=20 476.alb	1	1	Optimal	0.11	11	11.00	0.00
instance n=20 477.alb	1	1	Optimal	0.07	11	11.00	0.00
instance n=20 478.alb	1	1	Optimal	0.05	12	12.00	0.00
instance n=20 479.alb	1	1	Optimal	0.08	13	13.00	0.00
instance n=20 48.alb	1	1	Optimal	0.25	5	5.00	0.00
instance n=20 480.alb	1	1	Optimal	0.13	13	13.00	0.00
instance n=20 481.alb	1	1	Optimal	0.16	13	13.00	0.00
instance n=20 482.alb	1	1	Optimal	0.08	13	13.00	0.00
instance n=20 483.alb	1	1	Optimal	0.06	12	12.00	0.00
instance n=20 484.alb	1	1	Optimal	0.13	13	13.00	0.00
instance n=20 485.alb	1	1	Optimal	0.16	15	15.00	0.00
instance n=20 486.alb	1	1	Optimal	0.07	11	11.00	0.00
instance n=20 487.alb	1	1	Optimal	0.07	12	12.00	0.00
instance n=20 488.alb	1	1	Optimal	0.17	15	15.00	0.00
instance n=20 489.alb	1	1	Optimal	0.06	12	12.00	0.00
instance n=20 49.alb	1	1	Optimal	0.32	4	4.00	0.00
instance n=20 490.alb	1	1	Optimal	0.14	12	12.00	0.00
instance n=20 491.alb	1	1	Optimal	0.06	6	6.00	0.00
instance n=20 492.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 493.alb	1	1	Optimal	0.02	5	5.00	0.00
instance n=20 494.alb	1	1	Optimal	0.06	6	6.00	0.00
instance n=20 495.alb	1	1	Optimal	0.06	6	6.00	0.00
instance n=20 496.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 497.alb	1	1	Optimal	0.05	6	6.00	0.00
instance n=20 498.alb	1	1	Optimal	0.06	6	6.00	0.00
instance n=20 499.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 5.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 50.alb	1	1	Optimal	0.36	4	4.00	0.00
instance n=20 500.alb	1	1	Optimal	0.08	8	8.00	0.00
instance n=20 501.alb	1	1	Optimal	0.11	5	5.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 502.alb	1	1	Optimal	0.06	4	4.00	0.00
instance n=20 503.alb	1	1	Optimal	0.08	6	6.00	0.00
instance n=20 504.alb	1	1	Optimal	0.07	6	6.00	0.00
instance n=20 505.alb	1	1	Optimal	0.08	6	6.00	0.00
instance n=20 506.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 507.alb	1	1	Optimal	0.04	5	5.00	0.00
instance n=20 508.alb	1	1	Optimal	0.07	5	5.00	0.00
instance n=20 509.alb	1	1	Optimal	0.03	4	4.00	0.00
instance n=20 51.alb	1	1	Optimal	0.30	4	4.00	0.00
instance n=20 510.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 511.alb	1	1	Optimal	0.06	5	5.00	0.00
instance n=20 512.alb	1	1	Optimal	0.06	5	5.00	0.00
instance n=20 513.alb	1	1	Optimal	0.05	5	5.00	0.00
instance n=20 514.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 515.alb	1	1	Optimal	0.06	6	6.00	0.00
instance n=20 516.alb	1	1	Optimal	0.36	3	3.00	0.00
instance n=20 517.alb	1	1	Optimal	0.31	3	3.00	0.00
instance n=20 518.alb	1	1	Optimal	0.58	3	3.00	0.00
instance n=20 519.alb	1	1	Optimal	0.39	3	3.00	0.00
instance n=20 52.alb	1	1	Optimal	0.44	4	4.00	0.00
instance n=20 520.alb	1	1	Optimal	0.39	3	3.00	0.00
instance n=20 521.alb	1	1	Optimal	0.37	3	3.00	0.00
instance n=20 522.alb	1	1	Optimal	0.40	3	3.00	0.00
instance n=20 523.alb	1	1	Optimal	0.43	3	3.00	0.00
instance n=20 524.alb	1	1	Optimal	0.38	3	3.00	0.00
instance n=20 525.alb	1	1	Optimal	0.45	3	3.00	0.00
instance n=20 53.alb	1	1	Optimal	0.24	5	5.00	0.00
instance n=20 54.alb	1	1	Optimal	0.17	5	5.00	0.00
instance n=20 55.alb	1	1	Optimal	0.41	5	5.00	0.00
instance n=20 56.alb	1	1	Optimal	0.38	4	4.00	0.00
instance n=20 57.alb	1	1	Optimal	0.37	4	4.00	0.00
instance n=20 58.alb	1	1	Optimal	0.25	5	5.00	0.00
instance n=20 59.alb	1	1	Optimal	0.55	4	4.00	0.00
instance n=20 6.alb	1	1	Optimal	0.05	3	3.00	0.00
instance n=20 60.alb	1	1	Optimal	0.43	6	6.00	0.00
instance n=20 61.alb	1	1	Optimal	0.38	7	7.00	0.00
instance n=20 62.alb	1	1	Optimal	0.22	5	5.00	0.00
instance n=20 63.alb	1	1	Optimal	0.59	5	5.00	0.00
instance n=20 64.alb	1	1	Optimal	0.28	5	5.00	0.00
instance n=20 65.alb	1	1	Optimal	0.27	5	5.00	0.00
instance n=20 66.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 67.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 68.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 69.alb	1	1	Optimal	0.05	2	2.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 7.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 70.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 71.alb	1	1	Optimal	0.22	3	3.00	0.00
instance n=20 72.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 73.alb	1	1	Optimal	0.09	2	2.00	0.00
instance n=20 74.alb	1	1	Optimal	0.28	3	3.00	0.00
instance n=20 75.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 76.alb	1	1	Optimal	0.13	3	3.00	0.00
instance n=20 77.alb	1	1	Optimal	0.22	3	3.00	0.00
instance n=20 78.alb	1	1	Optimal	0.16	3	3.00	0.00
instance n=20 79.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 8.alb	1	1	Optimal	0.19	3	3.00	0.00
instance n=20 80.alb	1	1	Optimal	0.13	3	3.00	0.00
instance n=20 81.alb	1	1	Optimal	0.20	3	3.00	0.00
instance n=20 82.alb	1	1	Optimal	0.22	4	4.00	0.00
instance n=20 83.alb	1	1	Optimal	0.09	3	3.00	0.00
instance n=20 84.alb	1	1	Optimal	0.20	3	3.00	0.00
instance n=20 85.alb	1	1	Optimal	0.25	3	3.00	0.00
instance n=20 86.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 87.alb	1	1	Optimal	0.34	3	3.00	0.00
instance n=20 88.alb	1	1	Optimal	0.26	3	3.00	0.00
instance n=20 89.alb	1	1	Optimal	0.22	3	3.00	0.00
instance n=20 9.alb	1	1	Optimal	0.44	3	3.00	0.00
instance n=20 90.alb	1	1	Optimal	0.20	3	3.00	0.00
instance n=20 91.alb	1	1	Optimal	0.21	11	11.00	0.00
instance n=20 92.alb	1	1	Optimal	0.20	11	11.00	0.00
instance n=20 93.alb	1	1	Optimal	0.97	13	13.00	0.00
instance n=20 94.alb	1	1	Optimal	0.20	10	10.00	0.00
instance n=20 95.alb	1	1	Optimal	0.22	12	12.00	0.00
instance n=20 96.alb	1	1	Optimal	0.25	10	10.00	0.00
instance n=20 97.alb	1	1	Optimal	4.83	15	15.00	0.00
instance n=20 98.alb	1	1	Optimal	0.96	13	13.00	0.00
instance n=20 99.alb	1	1	Optimal	0.28	12	12.00	0.00
instance n=50 1.alb	1	1	Optimal	2.53	8	8.00	0.00
instance n=50 10.alb	1	1	Optimal	1.82	7	7.00	0.00
instance n=50 100.alb	1	1	Optimal	2.64	7	7.00	0.00
instance n=50 101.alb	1	1	Solution	30.01	30	26.00	13.33
instance n=50 102.alb	1	1	Solution	30.02	32	27.00	15.63
instance n=50 103.alb	1	1	Solution	30.02	29	25.00	13.79
instance n=50 104.alb	1	1	Solution	30.02	27	25.00	7.41
instance n=50 105.alb	1	1	Solution	30.01	24	23.00	4.17
instance n=50 106.alb	1	1	Solution	30.02	28	26.00	7.14
instance n=50 107.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 108.alb	1	1	Solution	30.02	30	26.00	13.33

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 109.alb	1	1	Solution	30.01	30	25.00	16.67
instance n=50 11.alb	1	1	Optimal	3.16	7	7.00	0.00
instance n=50 110.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 111.alb	1	1	Solution	30.03	28	26.00	7.14
instance n=50 112.alb	1	1	Solution	30.02	27	25.00	7.41
instance n=50 113.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 114.alb	1	1	Solution	30.02	27	26.00	3.70
instance n=50 115.alb	1	1	Solution	30.01	28	25.00	10.71
instance n=50 116.alb	1	1	Solution	30.00	32	26.00	18.75
instance n=50 117.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 118.alb	1	1	Solution	30.02	29	26.00	10.34
instance n=50 119.alb	1	1	Solution	30.01	25	25.00	0.00
instance n=50 12.alb	1	1	Optimal	0.11	6	6.00	0.00
instance n=50 120.alb	1	1	Solution	30.02	27	26.00	3.70
instance n=50 121.alb	1	1	Solution	30.01	32	27.00	15.63
instance n=50 122.alb	1	1	Solution	30.02	29	26.00	10.34
instance n=50 123.alb	1	1	Solution	30.01	32	26.00	18.75
instance n=50 124.alb	1	1	Solution	30.02	29	26.00	10.34
instance n=50 125.alb	1	1	Solution	30.02	33	27.00	18.18
instance n=50 126.alb	1	1	Optimal	1.34	12	12.00	0.00
instance n=50 127.alb	1	1	Optimal	13.35	14	14.00	0.00
instance n=50 128.alb	1	1	Optimal	14.05	12	12.00	0.00
instance n=50 129.alb	1	1	Optimal	3.52	13	13.00	0.00
instance n=50 13.alb	1	1	Optimal	0.69	6	6.00	0.00
instance n=50 130.alb	1	1	Optimal	7.68	13	13.00	0.00
instance n=50 131.alb	1	1	Optimal	25.45	12	12.00	0.00
instance n=50 132.alb	1	1	Optimal	19.66	12	12.00	0.00
instance n=50 133.alb	1	1	Optimal	5.18	12	12.00	0.00
instance n=50 134.alb	1	1	Optimal	27.01	14	14.00	0.00
instance n=50 135.alb	1	1	Optimal	9.62	13	13.00	0.00
instance n=50 136.alb	1	1	Optimal	6.73	11	11.00	0.00
instance n=50 137.alb	1	1	Optimal	9.53	11	11.00	0.00
instance n=50 138.alb	1	1	Optimal	22.13	12	12.00	0.00
instance n=50 139.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 14.alb	1	1	Optimal	5.12	7	7.00	0.00
instance n=50 140.alb	1	1	Optimal	4.04	12	12.00	0.00
instance n=50 141.alb	1	1	Optimal	7.86	13	13.00	0.00
instance n=50 142.alb	1	1	Optimal	14.21	11	11.00	0.00
instance n=50 143.alb	1	1	Optimal	5.29	12	12.00	0.00
instance n=50 144.alb	1	1	Optimal	1.32	13	13.00	0.00
instance n=50 145.alb	1	1	Optimal	4.36	10	10.00	0.00
instance n=50 146.alb	1	1	Optimal	5.24	13	13.00	0.00
instance n=50 147.alb	1	1	Optimal	1.16	13	13.00	0.00
instance n=50 148.alb	1	1	Optimal	3.08	10	10.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 149.alb	1	1	Optimal	3.47	12	12.00	0.00
instance n=50 15.alb	1	1	Optimal	7.09	8	8.00	0.00
instance n=50 150.alb	1	1	Optimal	1.88	11	11.00	0.00
instance n=50 151.alb	1	1	Optimal	1.73	7	7.00	0.00
instance n=50 152.alb	1	1	Optimal	3.74	7	7.00	0.00
instance n=50 153.alb	1	1	Optimal	0.99	7	7.00	0.00
instance n=50 154.alb	1	1	Optimal	4.50	8	8.00	0.00
instance n=50 155.alb	1	1	Optimal	2.84	7	7.00	0.00
instance n=50 156.alb	1	1	Optimal	3.24	7	7.00	0.00
instance n=50 157.alb	1	1	Optimal	1.65	8	8.00	0.00
instance n=50 158.alb	1	1	Optimal	1.30	7	7.00	0.00
instance n=50 159.alb	1	1	Optimal	4.10	7	7.00	0.00
instance n=50 16.alb	1	1	Optimal	2.36	8	8.00	0.00
instance n=50 160.alb	1	1	Optimal	6.03	8	8.00	0.00
instance n=50 161.alb	1	1	Optimal	1.22	7	7.00	0.00
instance n=50 162.alb	1	1	Optimal	3.71	8	8.00	0.00
instance n=50 163.alb	1	1	Optimal	3.74	7	7.00	0.00
instance n=50 164.alb	1	1	Optimal	2.38	7	7.00	0.00
instance n=50 165.alb	1	1	Optimal	6.36	8	8.00	0.00
instance n=50 166.alb	1	1	Optimal	5.37	8	8.00	0.00
instance n=50 167.alb	1	1	Optimal	5.00	7	7.00	0.00
instance n=50 168.alb	1	1	Optimal	12.17	8	8.00	0.00
instance n=50 169.alb	1	1	Optimal	10.21	8	8.00	0.00
instance n=50 17.alb	1	1	Optimal	1.43	7	7.00	0.00
instance n=50 170.alb	1	1	Optimal	4.80	7	7.00	0.00
instance n=50 171.alb	1	1	Optimal	2.79	8	8.00	0.00
instance n=50 172.alb	1	1	Optimal	0.64	7	7.00	0.00
instance n=50 173.alb	1	1	Optimal	2.36	7	7.00	0.00
instance n=50 174.alb	1	1	Optimal	2.62	7	7.00	0.00
instance n=50 175.alb	1	1	Optimal	1.92	7	7.00	0.00
instance n=50 176.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 177.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 178.alb	1	1	Solution	30.01	28	25.00	10.71
instance n=50 179.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 18.alb	1	1	Optimal	3.72	7	7.00	0.00
instance n=50 180.alb	1	1	Solution	30.02	26	25.00	3.85
instance n=50 181.alb	1	1	Solution	30.01	30	26.00	13.33
instance n=50 182.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 183.alb	1	1	Solution	30.02	29	26.00	10.34
instance n=50 184.alb	1	1	Solution	30.01	38	28.00	26.32
instance n=50 185.alb	1	1	Solution	30.00	27	25.00	7.41
instance n=50 186.alb	1	1	Solution	30.00	26	25.00	3.85
instance n=50 187.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 188.alb	1	1	Solution	30.01	25	24.00	4.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 189.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 19.alb	1	1	Optimal	4.06	8	8.00	0.00
instance n=50 190.alb	1	1	Solution	30.00	30	26.00	13.33
instance n=50 191.alb	1	1	Solution	30.00	28	26.00	7.14
instance n=50 192.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 193.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 194.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 195.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 196.alb	1	1	Solution	30.02	27	26.00	3.70
instance n=50 197.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 198.alb	1	1	Solution	30.01	28	25.00	10.71
instance n=50 199.alb	1	1	Solution	30.01	29	26.00	10.34
instance n=50 2.alb	1	1	Optimal	0.09	6	6.00	0.00
instance n=50 20.alb	1	1	Optimal	1.59	8	8.00	0.00
instance n=50 200.alb	1	1	Solution	30.01	25	24.00	4.00
instance n=50 201.alb	1	1	Solution	30.01	13	13.00	0.00
instance n=50 202.alb	1	1	Optimal	23.56	9	9.00	0.00
instance n=50 203.alb	1	1	Optimal	23.13	11	11.00	0.00
instance n=50 204.alb	1	1	Optimal	18.27	10	10.00	0.00
instance n=50 205.alb	1	1	Solution	30.02	13	13.00	0.00
instance n=50 206.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 207.alb	1	1	Solution	30.02	10	10.00	0.00
instance n=50 208.alb	1	1	Solution	30.02	13	13.00	0.00
instance n=50 209.alb	1	1	Optimal	13.34	11	11.00	0.00
instance n=50 21.alb	1	1	Optimal	1.13	6	6.00	0.00
instance n=50 210.alb	1	1	Solution	30.01	13	13.00	0.00
instance n=50 211.alb	1	1	Optimal	16.30	12	12.00	0.00
instance n=50 212.alb	1	1	Solution	30.02	10	10.00	0.00
instance n=50 213.alb	1	1	Solution	30.02	13	13.00	0.00
instance n=50 214.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 215.alb	1	1	Optimal	8.12	11	11.00	0.00
instance n=50 216.alb	1	1	Solution	30.00	12	12.00	0.00
instance n=50 217.alb	1	1	Solution	30.00	13	13.00	0.00
instance n=50 218.alb	1	1	Solution	30.00	12	12.00	0.00
instance n=50 219.alb	1	1	Optimal	28.17	11	11.00	0.00
instance n=50 22.alb	1	1	Optimal	2.25	7	7.00	0.00
instance n=50 220.alb	1	1	Optimal	20.67	11	11.00	0.00
instance n=50 221.alb	1	1	Optimal	29.01	11	11.00	0.00
instance n=50 222.alb	1	1	Solution	30.01	14	14.00	0.00
instance n=50 223.alb	1	1	Solution	30.02	11	11.00	0.00
instance n=50 224.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 225.alb	1	1	Optimal	2.01	12	12.00	0.00
instance n=50 226.alb	1	1	Optimal	0.74	7	7.00	0.00
instance n=50 227.alb	1	1	Optimal	0.46	6	6.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 228.alb	1	1	Optimal	0.74	6	6.00	0.00
instance n=50 229.alb	1	1	Optimal	1.32	6	6.00	0.00
instance n=50 23.alb	1	1	Optimal	6.42	7	7.00	0.00
instance n=50 230.alb	1	1	Optimal	1.10	7	7.00	0.00
instance n=50 231.alb	1	1	Optimal	0.54	7	7.00	0.00
instance n=50 232.alb	1	1	Optimal	1.64	7	7.00	0.00
instance n=50 233.alb	1	1	Optimal	1.04	6	6.00	0.00
instance n=50 234.alb	1	1	Optimal	0.50	8	8.00	0.00
instance n=50 235.alb	1	1	Optimal	0.51	7	7.00	0.00
instance n=50 236.alb	1	1	Optimal	2.07	7	7.00	0.00
instance n=50 237.alb	1	1	Optimal	2.00	8	8.00	0.00
instance n=50 238.alb	1	1	Optimal	0.65	7	7.00	0.00
instance n=50 239.alb	1	1	Optimal	2.31	7	7.00	0.00
instance n=50 24.alb	1	1	Optimal	2.13	7	7.00	0.00
instance n=50 240.alb	1	1	Optimal	2.05	7	7.00	0.00
instance n=50 241.alb	1	1	Optimal	1.44	7	7.00	0.00
instance n=50 242.alb	1	1	Optimal	1.08	8	8.00	0.00
instance n=50 243.alb	1	1	Optimal	1.09	7	7.00	0.00
instance n=50 244.alb	1	1	Optimal	0.75	7	7.00	0.00
instance n=50 245.alb	1	1	Optimal	1.82	7	7.00	0.00
instance n=50 246.alb	1	1	Optimal	1.74	8	8.00	0.00
instance n=50 247.alb	1	1	Optimal	0.83	7	7.00	0.00
instance n=50 248.alb	1	1	Optimal	1.78	7	7.00	0.00
instance n=50 249.alb	1	1	Optimal	2.05	7	7.00	0.00
instance n=50 25.alb	1	1	Optimal	1.17	6	6.00	0.00
instance n=50 250.alb	1	1	Optimal	1.09	7	7.00	0.00
instance n=50 251.alb	1	1	Solution	30.03	27	25.00	7.41
instance n=50 252.alb	1	1	Solution	30.01	32	27.00	15.63
instance n=50 253.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 254.alb	1	1	Solution	30.01	30	26.00	13.33
instance n=50 255.alb	1	1	Solution	30.00	29	25.00	13.79
instance n=50 256.alb	1	1	Solution	30.01	30	27.00	10.00
instance n=50 257.alb	1	1	Solution	30.01	33	27.00	18.18
instance n=50 258.alb	1	1	Solution	30.00	28	25.00	10.71
instance n=50 259.alb	1	1	Solution	30.02	31	26.00	16.13
instance n=50 26.alb	1	1	Solution	30.00	27	25.00	7.41
instance n=50 260.alb	1	1	Solution	30.01	29	26.00	10.34
instance n=50 261.alb	1	1	Solution	30.01	28	25.00	10.71
instance n=50 262.alb	1	1	Solution	30.02	31	26.00	16.13
instance n=50 263.alb	1	1	Solution	30.02	30	26.00	13.33
instance n=50 264.alb	1	1	Solution	30.02	27	25.00	7.41
instance n=50 265.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 266.alb	1	1	Optimal	25.41	29	29.00	0.00
instance n=50 267.alb	1	1	Solution	30.02	28	26.00	7.14

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 268.alb	1	1	Solution	30.02	29	26.00	10.34
instance n=50 269.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 27.alb	1	1	Solution	30.01	30	27.00	10.00
instance n=50 270.alb	1	1	Solution	30.02	28	26.00	7.14
instance n=50 271.alb	1	1	Solution	30.00	31	26.00	16.13
instance n=50 272.alb	1	1	Solution	30.00	27	25.00	7.41
instance n=50 273.alb	1	1	Optimal	21.77	27	27.00	0.00
instance n=50 274.alb	1	1	Solution	30.01	29	26.00	10.34
instance n=50 275.alb	1	1	Solution	30.01	27	26.00	3.70
instance n=50 276.alb	1	1	Optimal	1.11	12	12.00	0.00
instance n=50 277.alb	1	1	Optimal	0.93	13	13.00	0.00
instance n=50 278.alb	1	1	Optimal	2.20	12	12.00	0.00
instance n=50 279.alb	1	1	Optimal	4.75	11	11.00	0.00
instance n=50 28.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 280.alb	1	1	Optimal	6.05	13	13.00	0.00
instance n=50 281.alb	1	1	Optimal	1.60	11	11.00	0.00
instance n=50 282.alb	1	1	Optimal	1.30	12	12.00	0.00
instance n=50 283.alb	1	1	Optimal	2.29	12	12.00	0.00
instance n=50 284.alb	1	1	Optimal	1.17	11	11.00	0.00
instance n=50 285.alb	1	1	Optimal	1.06	13	13.00	0.00
instance n=50 286.alb	1	1	Optimal	1.56	11	11.00	0.00
instance n=50 287.alb	1	1	Optimal	4.99	12	12.00	0.00
instance n=50 288.alb	1	1	Optimal	1.25	10	10.00	0.00
instance n=50 289.alb	1	1	Optimal	6.13	11	11.00	0.00
instance n=50 29.alb	1	1	Solution	30.01	29	25.00	13.79
instance n=50 290.alb	1	1	Optimal	5.38	14	14.00	0.00
instance n=50 291.alb	1	1	Optimal	2.28	12	12.00	0.00
instance n=50 292.alb	1	1	Optimal	3.57	13	13.00	0.00
instance n=50 293.alb	1	1	Optimal	2.34	12	12.00	0.00
instance n=50 294.alb	1	1	Optimal	11.50	13	13.00	0.00
instance n=50 295.alb	1	1	Optimal	4.77	16	16.00	0.00
instance n=50 296.alb	1	1	Optimal	2.65	13	13.00	0.00
instance n=50 297.alb	1	1	Optimal	2.09	13	13.00	0.00
instance n=50 298.alb	1	1	Optimal	3.42	11	11.00	0.00
instance n=50 299.alb	1	1	Optimal	1.39	12	12.00	0.00
instance n=50 3.alb	1	1	Optimal	2.15	8	8.00	0.00
instance n=50 30.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 300.alb	1	1	Optimal	1.44	12	12.00	0.00
instance n=50 301.alb	1	1	Optimal	0.42	6	6.00	0.00
instance n=50 302.alb	1	1	Optimal	1.08	7	7.00	0.00
instance n=50 303.alb	1	1	Optimal	1.99	8	8.00	0.00
instance n=50 304.alb	1	1	Optimal	2.77	7	7.00	0.00
instance n=50 305.alb	1	1	Optimal	2.50	8	8.00	0.00
instance n=50 306.alb	1	1	Optimal	2.69	7	7.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 307.alb	1	1	Optimal	0.87	7	7.00	0.00
instance n=50 308.alb	1	1	Optimal	2.77	8	8.00	0.00
instance n=50 309.alb	1	1	Optimal	3.75	7	7.00	0.00
instance n=50 31.alb	1	1	Solution	30.00	28	25.00	10.71
instance n=50 310.alb	1	1	Optimal	5.32	8	8.00	0.00
instance n=50 311.alb	1	1	Optimal	7.07	8	8.00	0.00
instance n=50 312.alb	1	1	Optimal	0.39	6	6.00	0.00
instance n=50 313.alb	1	1	Optimal	3.06	8	8.00	0.00
instance n=50 314.alb	1	1	Optimal	0.80	7	7.00	0.00
instance n=50 315.alb	1	1	Optimal	2.46	8	8.00	0.00
instance n=50 316.alb	1	1	Optimal	2.61	8	8.00	0.00
instance n=50 317.alb	1	1	Optimal	1.11	6	6.00	0.00
instance n=50 318.alb	1	1	Optimal	6.05	8	8.00	0.00
instance n=50 319.alb	1	1	Optimal	3.00	7	7.00	0.00
instance n=50 32.alb	1	1	Solution	30.02	25	25.00	0.00
instance n=50 320.alb	1	1	Optimal	5.77	8	8.00	0.00
instance n=50 321.alb	1	1	Optimal	1.42	6	6.00	0.00
instance n=50 322.alb	1	1	Optimal	1.33	7	7.00	0.00
instance n=50 323.alb	1	1	Optimal	1.95	7	7.00	0.00
instance n=50 324.alb	1	1	Optimal	1.55	7	7.00	0.00
instance n=50 325.alb	1	1	Optimal	0.82	7	7.00	0.00
instance n=50 326.alb	1	1	Solution	30.03	33	27.00	18.18
instance n=50 327.alb	1	1	Solution	30.00	28	25.00	10.71
instance n=50 328.alb	1	1	Solution	30.03	32	27.00	15.63
instance n=50 329.alb	1	1	Solution	30.01	24	24.00	0.00
instance n=50 33.alb	1	1	Solution	30.01	25	24.00	4.00
instance n=50 330.alb	1	1	Solution	30.01	29	25.00	13.79
instance n=50 331.alb	1	1	Solution	30.01	29	26.00	10.34
instance n=50 332.alb	1	1	Solution	30.02	25	24.00	4.00
instance n=50 333.alb	1	1	Solution	30.00	28	25.00	10.71
instance n=50 334.alb	1	1	Solution	30.02	29	25.00	13.79
instance n=50 335.alb	1	1	Solution	30.02	27	26.00	3.70
instance n=50 336.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 337.alb	1	1	Solution	30.00	26	25.00	3.85
instance n=50 338.alb	1	1	Solution	30.02	26	25.00	3.85
instance n=50 339.alb	1	1	Solution	30.01	27	26.00	3.70
instance n=50 34.alb	1	1	Solution	30.01	30	26.00	13.33
instance n=50 340.alb	1	1	Solution	30.01	28	25.00	10.71
instance n=50 341.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 342.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 343.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 344.alb	1	1	Solution	30.02	30	26.00	13.33
instance n=50 345.alb	1	1	Solution	30.01	29	26.00	10.34
instance n=50 346.alb	1	1	Solution	30.00	27	25.00	7.41

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 347.alb	1	1	Solution	30.01	25	24.00	4.00
instance n=50 348.alb	1	1	Solution	30.02	30	25.00	16.67
instance n=50 349.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 35.alb	1	1	Solution	30.01	32	27.00	15.63
instance n=50 350.alb	1	1	Solution	30.00	24	23.00	4.17
instance n=50 351.alb	1	1	Solution	30.02	12	12.00	0.00
instance n=50 352.alb	1	1	Optimal	25.25	10	10.00	0.00
instance n=50 353.alb	1	1	Solution	30.00	13	13.00	0.00
instance n=50 354.alb	1	1	Solution	30.00	13	13.00	0.00
instance n=50 355.alb	1	1	Optimal	11.66	11	11.00	0.00
instance n=50 356.alb	1	1	Solution	30.03	15	15.00	0.00
instance n=50 357.alb	1	1	Solution	30.01	12	12.00	0.00
instance n=50 358.alb	1	1	Optimal	1.75	11	11.00	0.00
instance n=50 359.alb	1	1	Optimal	8.68	10	10.00	0.00
instance n=50 36.alb	1	1	Solution	30.01	31	26.00	16.13
instance n=50 360.alb	1	1	Solution	30.02	12	12.00	0.00
instance n=50 361.alb	1	1	Optimal	27.58	11	11.00	0.00
instance n=50 362.alb	1	1	Solution	30.00	10	10.00	0.00
instance n=50 363.alb	1	1	Optimal	9.93	11	11.00	0.00
instance n=50 364.alb	1	1	Solution	30.01	13	13.00	0.00
instance n=50 365.alb	1	1	Optimal	7.86	11	11.00	0.00
instance n=50 366.alb	1	1	Solution	30.02	13	13.00	0.00
instance n=50 367.alb	1	1	Solution	30.01	12	12.00	0.00
instance n=50 368.alb	1	1	Solution	30.00	12	12.00	0.00
instance n=50 369.alb	1	1	Solution	30.01	12	12.00	0.00
instance n=50 37.alb	1	1	Solution	30.00	32	27.00	15.63
instance n=50 370.alb	1	1	Optimal	23.75	12	12.00	0.00
instance n=50 371.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 372.alb	1	1	Solution	30.01	10	10.00	0.00
instance n=50 373.alb	1	1	Solution	30.02	12	12.00	0.00
instance n=50 374.alb	1	1	Optimal	12.47	11	11.00	0.00
instance n=50 375.alb	1	1	Solution	30.00	13	13.00	0.00
instance n=50 376.alb	1	1	Optimal	2.20	7	7.00	0.00
instance n=50 377.alb	1	1	Optimal	3.87	7	7.00	0.00
instance n=50 378.alb	1	1	Optimal	1.36	8	8.00	0.00
instance n=50 379.alb	1	1	Optimal	1.21	7	7.00	0.00
instance n=50 38.alb	1	1	Solution	30.01	31	27.00	12.90
instance n=50 380.alb	1	1	Optimal	3.02	7	7.00	0.00
instance n=50 381.alb	1	1	Optimal	1.57	8	8.00	0.00
instance n=50 382.alb	1	1	Optimal	1.70	6	6.00	0.00
instance n=50 383.alb	1	1	Optimal	1.66	7	7.00	0.00
instance n=50 384.alb	1	1	Optimal	2.41	8	8.00	0.00
instance n=50 385.alb	1	1	Optimal	3.08	7	7.00	0.00
instance n=50 386.alb	1	1	Optimal	2.38	7	7.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 387.alb	1	1	Optimal	2.44	8	8.00	0.00
instance n=50 388.alb	1	1	Optimal	1.92	7	7.00	0.00
instance n=50 389.alb	1	1	Optimal	1.15	8	8.00	0.00
instance n=50 39.alb	1	1	Solution	30.00	29	26.00	10.34
instance n=50 390.alb	1	1	Optimal	3.15	7	7.00	0.00
instance n=50 391.alb	1	1	Optimal	3.61	7	7.00	0.00
instance n=50 392.alb	1	1	Optimal	1.85	8	8.00	0.00
instance n=50 393.alb	1	1	Optimal	2.30	7	7.00	0.00
instance n=50 394.alb	1	1	Optimal	2.24	8	8.00	0.00
instance n=50 395.alb	1	1	Optimal	3.08	7	7.00	0.00
instance n=50 396.alb	1	1	Optimal	1.97	8	8.00	0.00
instance n=50 397.alb	1	1	Optimal	1.03	7	7.00	0.00
instance n=50 398.alb	1	1	Optimal	1.25	6	6.00	0.00
instance n=50 399.alb	1	1	Optimal	0.83	7	7.00	0.00
instance n=50 4.alb	1	1	Optimal	2.91	7	7.00	0.00
instance n=50 40.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 400.alb	1	1	Optimal	1.30	8	8.00	0.00
instance n=50 401.alb	1	1	Solution	30.02	28	25.00	10.71
instance n=50 402.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 403.alb	1	1	Solution	30.00	34	27.00	20.59
instance n=50 404.alb	1	1	Solution	30.00	31	26.00	16.13
instance n=50 405.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 406.alb	1	1	Solution	30.00	32	27.00	15.63
instance n=50 407.alb	1	1	Solution	30.02	29	26.00	10.34
instance n=50 408.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 409.alb	1	1	Solution	30.02	33	26.00	21.21
instance n=50 41.alb	1	1	Solution	30.01	26	24.00	7.69
instance n=50 410.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 411.alb	1	1	Solution	30.01	29	26.00	10.34
instance n=50 412.alb	1	1	Solution	30.01	26	25.00	3.85
instance n=50 413.alb	1	1	Solution	30.01	30	26.00	13.33
instance n=50 414.alb	1	1	Solution	30.02	27	25.00	7.41
instance n=50 415.alb	1	1	Solution	30.01	28	25.00	10.71
instance n=50 416.alb	1	1	Solution	30.02	27	25.00	7.41
instance n=50 417.alb	1	1	Solution	30.01	30	27.00	10.00
instance n=50 418.alb	1	1	Solution	30.02	27	25.00	7.41
instance n=50 419.alb	1	1	Solution	30.01	33	27.00	18.18
instance n=50 42.alb	1	1	Solution	30.01	24	23.00	4.17
instance n=50 420.alb	1	1	Solution	30.01	28	25.00	10.71
instance n=50 421.alb	1	1	Solution	30.01	34	27.00	20.59
instance n=50 422.alb	1	1	Solution	30.01	29	25.00	13.79
instance n=50 423.alb	1	1	Solution	30.02	29	26.00	10.34
instance n=50 424.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 425.alb	1	1	Solution	30.02	34	28.00	17.65

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 426.alb	1	1	Optimal	5.58	11	11.00	0.00
instance n=50 427.alb	1	1	Optimal	2.41	12	12.00	0.00
instance n=50 428.alb	1	1	Optimal	13.16	13	13.00	0.00
instance n=50 429.alb	1	1	Optimal	3.28	11	11.00	0.00
instance n=50 43.alb	1	1	Solution	30.01	25	24.00	4.00
instance n=50 430.alb	1	1	Optimal	23.57	14	14.00	0.00
instance n=50 431.alb	1	1	Optimal	0.63	11	11.00	0.00
instance n=50 432.alb	1	1	Optimal	6.09	12	12.00	0.00
instance n=50 433.alb	1	1	Optimal	7.02	12	12.00	0.00
instance n=50 434.alb	1	1	Optimal	2.96	11	11.00	0.00
instance n=50 435.alb	1	1	Optimal	9.37	11	11.00	0.00
instance n=50 436.alb	1	1	Optimal	2.90	11	11.00	0.00
instance n=50 437.alb	1	1	Optimal	10.16	12	12.00	0.00
instance n=50 438.alb	1	1	Optimal	7.68	10	10.00	0.00
instance n=50 439.alb	1	1	Optimal	8.89	12	12.00	0.00
instance n=50 44.alb	1	1	Solution	30.01	25	24.00	4.00
instance n=50 440.alb	1	1	Optimal	2.96	13	13.00	0.00
instance n=50 441.alb	1	1	Optimal	2.19	11	11.00	0.00
instance n=50 442.alb	1	1	Optimal	4.25	12	12.00	0.00
instance n=50 443.alb	1	1	Optimal	7.27	11	11.00	0.00
instance n=50 444.alb	1	1	Optimal	7.47	12	12.00	0.00
instance n=50 445.alb	1	1	Optimal	6.98	12	12.00	0.00
instance n=50 446.alb	1	1	Optimal	5.47	12	12.00	0.00
instance n=50 447.alb	1	1	Optimal	18.49	13	13.00	0.00
instance n=50 448.alb	1	1	Optimal	11.07	12	12.00	0.00
instance n=50 449.alb	1	1	Optimal	6.43	11	11.00	0.00
instance n=50 45.alb	1	1	Solution	30.00	25	24.00	4.00
instance n=50 450.alb	1	1	Optimal	6.92	11	11.00	0.00
instance n=50 451.alb	1	1	Optimal	0.14	8	8.00	0.00
instance n=50 452.alb	1	1	Optimal	0.20	8	8.00	0.00
instance n=50 453.alb	1	1	Optimal	0.27	7	7.00	0.00
instance n=50 454.alb	1	1	Optimal	0.22	8	8.00	0.00
instance n=50 455.alb	1	1	Optimal	0.14	6	6.00	0.00
instance n=50 456.alb	1	1	Optimal	0.26	8	8.00	0.00
instance n=50 457.alb	1	1	Optimal	0.16	8	8.00	0.00
instance n=50 458.alb	1	1	Optimal	0.10	7	7.00	0.00
instance n=50 459.alb	1	1	Optimal	0.20	7	7.00	0.00
instance n=50 46.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 460.alb	1	1	Optimal	0.21	7	7.00	0.00
instance n=50 461.alb	1	1	Optimal	0.20	6	6.00	0.00
instance n=50 462.alb	1	1	Optimal	0.09	7	7.00	0.00
instance n=50 463.alb	1	1	Optimal	0.10	8	8.00	0.00
instance n=50 464.alb	1	1	Optimal	0.51	6	6.00	0.00
instance n=50 465.alb	1	1	Optimal	0.21	8	8.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 466.alb	1	1	Optimal	0.15	7	7.00	0.00
instance n=50 467.alb	1	1	Optimal	0.10	9	9.00	0.00
instance n=50 468.alb	1	1	Optimal	0.22	7	7.00	0.00
instance n=50 469.alb	1	1	Optimal	0.30	8	8.00	0.00
instance n=50 47.alb	1	1	Solution	30.01	28	26.00	7.14
instance n=50 470.alb	1	1	Optimal	0.14	8	8.00	0.00
instance n=50 471.alb	1	1	Optimal	0.14	7	7.00	0.00
instance n=50 472.alb	1	1	Optimal	0.10	8	8.00	0.00
instance n=50 473.alb	1	1	Optimal	0.33	7	7.00	0.00
instance n=50 474.alb	1	1	Optimal	0.10	7	7.00	0.00
instance n=50 475.alb	1	1	Optimal	0.10	6	6.00	0.00
instance n=50 476.alb	1	1	Optimal	0.97	28	28.00	0.00
instance n=50 477.alb	1	1	Optimal	1.47	29	29.00	0.00
instance n=50 478.alb	1	1	Optimal	2.80	32	32.00	0.00
instance n=50 479.alb	1	1	Optimal	0.78	28	28.00	0.00
instance n=50 48.alb	1	1	Solution	30.02	27	26.00	3.70
instance n=50 480.alb	1	1	Optimal	1.34	34	34.00	0.00
instance n=50 481.alb	1	1	Optimal	0.58	28	28.00	0.00
instance n=50 482.alb	1	1	Optimal	0.81	27	27.00	0.00
instance n=50 483.alb	1	1	Optimal	2.12	30	30.00	0.00
instance n=50 484.alb	1	1	Optimal	1.13	32	32.00	0.00
instance n=50 485.alb	1	1	Optimal	1.26	31	31.00	0.00
instance n=50 486.alb	1	1	Optimal	1.24	32	32.00	0.00
instance n=50 487.alb	1	1	Optimal	1.20	31	31.00	0.00
instance n=50 488.alb	1	1	Optimal	3.06	31	31.00	0.00
instance n=50 489.alb	1	1	Optimal	5.06	35	35.00	0.00
instance n=50 49.alb	1	1	Solution	30.01	25	24.00	4.00
instance n=50 490.alb	1	1	Optimal	0.97	29	29.00	0.00
instance n=50 491.alb	1	1	Optimal	23.89	35	35.00	0.00
instance n=50 492.alb	1	1	Optimal	2.28	29	29.00	0.00
instance n=50 493.alb	1	1	Optimal	1.36	30	30.00	0.00
instance n=50 494.alb	1	1	Optimal	3.67	32	32.00	0.00
instance n=50 495.alb	1	1	Optimal	0.97	34	34.00	0.00
instance n=50 496.alb	1	1	Optimal	1.15	29	29.00	0.00
instance n=50 497.alb	1	1	Optimal	0.87	30	30.00	0.00
instance n=50 498.alb	1	1	Optimal	1.26	30	30.00	0.00
instance n=50 499.alb	1	1	Optimal	2.48	33	33.00	0.00
instance n=50 5.alb	1	1	Optimal	1.66	7	7.00	0.00
instance n=50 50.alb	1	1	Solution	30.01	27	25.00	7.41
instance n=50 500.alb	1	1	Optimal	2.52	34	34.00	0.00
instance n=50 501.alb	1	1	Optimal	0.35	12	12.00	0.00
instance n=50 502.alb	1	1	Optimal	0.10	10	10.00	0.00
instance n=50 503.alb	1	1	Optimal	0.29	13	13.00	0.00
instance n=50 504.alb	1	1	Optimal	0.28	11	11.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 505.alb	1	1	Optimal	0.32	12	12.00	0.00
instance n=50 506.alb	1	1	Optimal	0.36	11	11.00	0.00
instance n=50 507.alb	1	1	Optimal	0.20	13	13.00	0.00
instance n=50 508.alb	1	1	Optimal	0.22	14	14.00	0.00
instance n=50 509.alb	1	1	Optimal	0.24	13	13.00	0.00
instance n=50 51.alb	1	1	Optimal	14.08	12	12.00	0.00
instance n=50 510.alb	1	1	Optimal	0.10	11	11.00	0.00
instance n=50 511.alb	1	1	Optimal	0.17	13	13.00	0.00
instance n=50 512.alb	1	1	Optimal	0.30	13	13.00	0.00
instance n=50 513.alb	1	1	Optimal	0.30	12	12.00	0.00
instance n=50 514.alb	1	1	Optimal	0.20	12	12.00	0.00
instance n=50 515.alb	1	1	Optimal	0.26	11	11.00	0.00
instance n=50 516.alb	1	1	Optimal	0.26	13	13.00	0.00
instance n=50 517.alb	1	1	Optimal	0.22	14	14.00	0.00
instance n=50 518.alb	1	1	Optimal	0.48	11	11.00	0.00
instance n=50 519.alb	1	1	Optimal	0.20	12	12.00	0.00
instance n=50 52.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 520.alb	1	1	Optimal	0.42	11	11.00	0.00
instance n=50 521.alb	1	1	Optimal	0.29	10	10.00	0.00
instance n=50 522.alb	1	1	Optimal	0.26	11	11.00	0.00
instance n=50 523.alb	1	1	Optimal	0.26	11	11.00	0.00
instance n=50 524.alb	1	1	Optimal	0.43	14	14.00	0.00
instance n=50 525.alb	1	1	Optimal	0.17	11	11.00	0.00
instance n=50 53.alb	1	1	Solution	30.01	13	12.00	7.69
instance n=50 54.alb	1	1	Optimal	7.41	11	11.00	0.00
instance n=50 55.alb	1	1	Solution	30.02	13	13.00	0.00
instance n=50 56.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 57.alb	1	1	Solution	30.00	13	13.00	0.00
instance n=50 58.alb	1	1	Solution	30.00	11	11.00	0.00
instance n=50 59.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 6.alb	1	1	Optimal	1.20	6	6.00	0.00
instance n=50 60.alb	1	1	Solution	30.00	12	12.00	0.00
instance n=50 61.alb	1	1	Solution	30.01	13	13.00	0.00
instance n=50 62.alb	1	1	Solution	30.02	13	13.00	0.00
instance n=50 63.alb	1	1	Solution	30.02	12	12.00	0.00
instance n=50 64.alb	1	1	Solution	30.01	13	13.00	0.00
instance n=50 65.alb	1	1	Solution	30.01	12	12.00	0.00
instance n=50 66.alb	1	1	Solution	30.02	12	12.00	0.00
instance n=50 67.alb	1	1	Solution	30.00	12	12.00	0.00
instance n=50 68.alb	1	1	Optimal	16.15	12	12.00	0.00
instance n=50 69.alb	1	1	Solution	30.01	12	12.00	0.00
instance n=50 7.alb	1	1	Optimal	2.86	7	7.00	0.00
instance n=50 70.alb	1	1	Solution	30.01	10	10.00	0.00
instance n=50 71.alb	1	1	Solution	30.01	13	13.00	0.00

Table 6.5: Results for SALBP-1 Problems Alternative (CPO) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 72.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 73.alb	1	1	Solution	30.01	11	11.00	0.00
instance n=50 74.alb	1	1	Solution	30.02	12	12.00	0.00
instance n=50 75.alb	1	1	Solution	30.00	11	11.00	0.00
instance n=50 76.alb	1	1	Optimal	2.43	7	7.00	0.00
instance n=50 77.alb	1	1	Optimal	1.03	7	7.00	0.00
instance n=50 78.alb	1	1	Optimal	1.92	7	7.00	0.00
instance n=50 79.alb	1	1	Optimal	5.30	8	8.00	0.00
instance n=50 8.alb	1	1	Optimal	3.57	7	7.00	0.00
instance n=50 80.alb	1	1	Optimal	0.86	7	7.00	0.00
instance n=50 81.alb	1	1	Optimal	1.82	7	7.00	0.00
instance n=50 82.alb	1	1	Optimal	0.99	6	6.00	0.00
instance n=50 83.alb	1	1	Optimal	8.28	8	8.00	0.00
instance n=50 84.alb	1	1	Optimal	0.84	7	7.00	0.00
instance n=50 85.alb	1	1	Optimal	2.04	8	8.00	0.00
instance n=50 86.alb	1	1	Optimal	1.92	7	7.00	0.00
instance n=50 87.alb	1	1	Optimal	7.00	8	8.00	0.00
instance n=50 88.alb	1	1	Optimal	0.52	8	8.00	0.00
instance n=50 89.alb	1	1	Optimal	1.53	7	7.00	0.00
instance n=50 9.alb	1	1	Optimal	3.01	9	9.00	0.00
instance n=50 90.alb	1	1	Optimal	1.39	7	7.00	0.00
instance n=50 91.alb	1	1	Optimal	1.68	7	7.00	0.00
instance n=50 92.alb	1	1	Optimal	5.09	7	7.00	0.00
instance n=50 93.alb	1	1	Optimal	1.44	7	7.00	0.00
instance n=50 94.alb	1	1	Optimal	3.35	7	7.00	0.00
instance n=50 95.alb	1	1	Optimal	1.19	7	7.00	0.00
instance n=50 96.alb	1	1	Optimal	0.99	7	7.00	0.00
instance n=50 97.alb	1	1	Optimal	1.42	7	7.00	0.00
instance n=50 98.alb	1	1	Optimal	3.41	8	8.00	0.00
instance n=50 99.alb	1	1	Optimal	2.26	7	7.00	0.00

6.5.2 CPSat

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat) (2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 1.alb	1	1	Solution	30.12	136	135.00	0.74
instance n=1000 10.alb	1	1	Solution	30.16	141	140.00	0.71
instance n=1000 11.alb	1	1	Solution	30.13	135	134.00	0.74
instance n=1000 12.alb	1	1	Solution	30.12	135	134.00	0.74

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 129.alb	1	1	Solution	30.12	225	222.00	1.33
instance n=1000 13.alb	1	1	Solution	30.12	132	131.00	0.76
instance n=1000 14.alb	1	1	Solution	30.13	138	136.00	1.45
instance n=1000 15.alb	1	1	Solution	30.13	137	135.00	1.46
instance n=1000 151.alb	1	1	Solution	30.12	139	138.00	0.72
instance n=1000 152.alb	1	1	Solution	30.13	138	136.00	1.45
instance n=1000 153.alb	1	1	Solution	30.10	138	137.00	0.72
instance n=1000 154.alb	1	1	Solution	30.14	141	140.00	0.71
instance n=1000 155.alb	1	1	Solution	30.16	141	139.00	1.42
instance n=1000 156.alb	1	1	Solution	30.13	143	141.00	1.40
instance n=1000 157.alb	1	1	Solution	30.12	141	140.00	0.71
instance n=1000 158.alb	1	1	Solution	30.14	137	136.00	0.73
instance n=1000 159.alb	1	1	Solution	30.11	139	138.00	0.72
instance n=1000 16.alb	1	1	Solution	30.13	138	137.00	0.72
instance n=1000 160.alb	1	1	Solution	30.14	140	138.00	1.43
instance n=1000 161.alb	1	1	Solution	30.13	134	132.00	1.49
instance n=1000 162.alb	1	1	Solution	30.13	137	135.00	1.46
instance n=1000 163.alb	1	1	Solution	30.13	141	139.00	1.42
instance n=1000 164.alb	1	1	Solution	30.15	143	141.00	1.40
instance n=1000 165.alb	1	1	Solution	30.12	137	135.00	1.46
instance n=1000 166.alb	1	1	Solution	30.11	141	139.00	1.42
instance n=1000 167.alb	1	1	Solution	30.17	141	139.00	1.42
instance n=1000 168.alb	1	1	Solution	30.12	140	138.00	1.43
instance n=1000 169.alb	1	1	Solution	30.14	136	134.00	1.47
instance n=1000 17.alb	1	1	Solution	30.11	136	134.00	1.47
instance n=1000 170.alb	1	1	Solution	30.14	136	134.00	1.47
instance n=1000 171.alb	1	1	Solution	30.15	138	137.00	0.72
instance n=1000 172.alb	1	1	Solution	30.13	136	135.00	0.74
instance n=1000 173.alb	1	1	Solution	30.12	136	135.00	0.74
instance n=1000 174.alb	1	1	Solution	30.12	137	136.00	0.73
instance n=1000 175.alb	1	1	Solution	30.15	140	138.00	1.43
instance n=1000 176.alb	1	1	Solution	30.13	561	500.00	10.87
instance n=1000 177.alb	1	1	Solution	30.12	547	499.00	8.78
instance n=1000 178.alb	1	1	Solution	30.13	564	505.00	10.46
instance n=1000 179.alb	1	1	Solution	30.10	565	505.00	10.62
instance n=1000 18.alb	1	1	Solution	30.12	135	134.00	0.74
instance n=1000 180.alb	1	1	Solution	30.12	566	502.00	11.31
instance n=1000 181.alb	1	1	Solution	30.29	566	505.00	10.78
instance n=1000 182.alb	1	1	Solution	30.35	560	502.00	10.36
instance n=1000 183.alb	1	1	Solution	30.12	554	499.00	9.93
instance n=1000 184.alb	1	1	Solution	30.11	557	501.00	10.05
instance n=1000 185.alb	1	1	Solution	30.11	557	502.00	9.87
instance n=1000 186.alb	1	1	Solution	30.58	552	500.00	9.42
instance n=1000 187.alb	1	1	Solution	30.89	565	505.00	10.62

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 188.alb	1	1	Solution	30.15	551	498.00	9.62
instance n=1000 189.alb	1	1	Solution	31.17	552	498.00	9.78
instance n=1000 19.alb	1	1	Solution	30.12	138	137.00	0.72
instance n=1000 190.alb	1	1	Solution	30.58	556	501.00	9.89
instance n=1000 191.alb	1	1	Solution	30.64	557	501.00	10.05
instance n=1000 192.alb	1	1	Solution	30.67	556	501.00	9.89
instance n=1000 193.alb	1	1	Solution	30.15	568	503.00	11.44
instance n=1000 194.alb	1	1	Solution	30.15	558	501.00	10.22
instance n=1000 195.alb	1	1	Solution	30.18	565	501.00	11.33
instance n=1000 196.alb	1	1	Solution	30.14	559	499.00	10.73
instance n=1000 197.alb	1	1	Solution	30.15	543	495.00	8.84
instance n=1000 198.alb	1	1	Solution	30.15	565	503.00	10.97
instance n=1000 199.alb	1	1	Solution	30.14	541	495.00	8.50
instance n=1000 2.alb	1	1	Solution	30.14	138	137.00	0.72
instance n=1000 20.alb	1	1	Solution	30.15	139	137.00	1.44
instance n=1000 200.alb	1	1	Solution	30.54	546	497.00	8.97
instance n=1000 201.alb	1	1	Solution	30.13	232	228.00	1.72
instance n=1000 202.alb	1	1	Solution	30.13	229	225.00	1.75
instance n=1000 203.alb	1	1	Solution	30.12	233	229.00	1.72
instance n=1000 204.alb	1	1	Solution	30.14	232	228.00	1.72
instance n=1000 205.alb	1	1	Solution	30.15	233	229.00	1.72
instance n=1000 206.alb	1	1	Solution	30.12	233	228.00	2.15
instance n=1000 207.alb	1	1	Solution	30.13	233	229.00	1.72
instance n=1000 208.alb	1	1	Solution	30.16	233	229.00	1.72
instance n=1000 209.alb	1	1	Solution	30.12	232	227.00	2.16
instance n=1000 21.alb	1	1	Solution	30.66	139	138.00	0.72
instance n=1000 210.alb	1	1	Solution	30.15	228	224.00	1.75
instance n=1000 211.alb	1	1	Solution	30.12	223	219.00	1.79
instance n=1000 212.alb	1	1	Solution	30.15	220	217.00	1.36
instance n=1000 213.alb	1	1	Solution	30.14	238	233.00	2.10
instance n=1000 214.alb	1	1	Solution	30.12	229	224.00	2.18
instance n=1000 215.alb	1	1	Solution	30.13	227	223.00	1.76
instance n=1000 216.alb	1	1	Solution	30.14	224	220.00	1.79
instance n=1000 217.alb	1	1	Solution	30.11	229	225.00	1.75
instance n=1000 218.alb	1	1	Solution	30.12	222	218.00	1.80
instance n=1000 219.alb	1	1	Solution	30.14	235	232.00	1.28
instance n=1000 22.alb	1	1	Solution	30.12	138	137.00	0.72
instance n=1000 220.alb	1	1	Solution	30.11	228	224.00	1.75
instance n=1000 221.alb	1	1	Solution	30.13	235	231.00	1.70
instance n=1000 222.alb	1	1	Solution	30.14	225	221.00	1.78
instance n=1000 223.alb	1	1	Solution	30.11	225	221.00	1.78
instance n=1000 224.alb	1	1	Solution	30.12	230	226.00	1.74
instance n=1000 225.alb	1	1	Solution	30.13	233	229.00	1.72
instance n=1000 226.alb	1	1	Solution	30.11	138	136.00	1.45

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 228.alb	1	1	Solution	30.15	135	133.00	1.48
instance n=1000 229.alb	1	1	Solution	30.11	136	134.00	1.47
instance n=1000 23.alb	1	1	Solution	30.14	137	136.00	0.73
instance n=1000 230.alb	1	1	Solution	30.12	133	131.00	1.50
instance n=1000 231.alb	1	1	Solution	30.11	140	138.00	1.43
instance n=1000 232.alb	1	1	Solution	30.11	135	133.00	1.48
instance n=1000 233.alb	1	1	Solution	30.09	137	135.00	1.46
instance n=1000 234.alb	1	1	Solution	30.14	139	137.00	1.44
instance n=1000 235.alb	1	1	Solution	30.11	135	133.00	1.48
instance n=1000 236.alb	1	1	Solution	30.11	138	136.00	1.45
instance n=1000 237.alb	1	1	Solution	30.14	140	138.00	1.43
instance n=1000 238.alb	1	1	Solution	30.12	140	138.00	1.43
instance n=1000 239.alb	1	1	Solution	30.10	136	135.00	0.74
instance n=1000 24.alb	1	1	Solution	30.13	141	140.00	0.71
instance n=1000 240.alb	1	1	Solution	30.13	137	135.00	1.46
instance n=1000 241.alb	1	1	Solution	30.12	140	138.00	1.43
instance n=1000 242.alb	1	1	Solution	30.10	137	135.00	1.46
instance n=1000 243.alb	1	1	Solution	30.11	139	137.00	1.44
instance n=1000 244.alb	1	1	Solution	30.09	139	136.00	2.16
instance n=1000 245.alb	1	1	Solution	30.10	137	135.00	1.46
instance n=1000 246.alb	1	1	Solution	30.10	137	135.00	1.46
instance n=1000 247.alb	1	1	Solution	30.10	140	138.00	1.43
instance n=1000 248.alb	1	1	Solution	30.12	141	138.00	2.13
instance n=1000 249.alb	1	1	Solution	30.09	140	138.00	1.43
instance n=1000 25.alb	1	1	Solution	30.14	137	135.00	1.46
instance n=1000 250.alb	1	1	Solution	30.09	142	140.00	1.41
instance n=1000 26.alb	1	1	Solution	30.12	553	501.00	9.40
instance n=1000 262.alb	1	1	Solution	30.16	557	494.00	11.31
instance n=1000 27.alb	1	1	Solution	30.12	550	502.00	8.73
instance n=1000 276.alb	1	1	Solution	30.12	222	217.00	2.25
instance n=1000 277.alb	1	1	Solution	30.10	230	225.00	2.17
instance n=1000 278.alb	1	1	Solution	30.11	226	220.00	2.65
instance n=1000 279.alb	1	1	Solution	30.13	220	215.00	2.27
instance n=1000 28.alb	1	1	Solution	30.10	534	496.00	7.12
instance n=1000 281.alb	1	1	Solution	30.11	226	219.00	3.10
instance n=1000 282.alb	1	1	Solution	30.13	219	214.00	2.28
instance n=1000 283.alb	1	1	Solution	30.13	230	224.00	2.61
instance n=1000 284.alb	1	1	Solution	30.09	222	217.00	2.25
instance n=1000 285.alb	1	1	Solution	30.12	227	221.00	2.64
instance n=1000 286.alb	1	1	Solution	30.11	226	221.00	2.21
instance n=1000 287.alb	1	1	Solution	30.13	229	224.00	2.18
instance n=1000 288.alb	1	1	Solution	30.15	224	219.00	2.23
instance n=1000 289.alb	1	1	Solution	30.16	226	220.00	2.65
instance n=1000 29.alb	1	1	Solution	30.10	540	498.00	7.78

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 290.alb	1	1	Solution	30.13	228	222.00	2.63
instance n=1000 291.alb	1	1	Solution	30.11	230	225.00	2.17
instance n=1000 292.alb	1	1	Solution	30.15	231	225.00	2.60
instance n=1000 293.alb	1	1	Solution	30.15	231	224.00	3.03
instance n=1000 295.alb	1	1	Solution	30.11	232	227.00	2.16
instance n=1000 296.alb	1	1	Solution	30.10	212	207.00	2.36
instance n=1000 297.alb	1	1	Solution	30.12	221	217.00	1.81
instance n=1000 298.alb	1	1	Solution	30.13	220	214.00	2.73
instance n=1000 3.alb	1	1	Solution	30.15	138	136.00	1.45
instance n=1000 30.alb	1	1	Solution	30.11	556	505.00	9.17
instance n=1000 300.alb	1	1	Solution	30.12	233	228.00	2.15
instance n=1000 301.alb	1	1	Solution	30.12	138	137.00	0.72
instance n=1000 302.alb	1	1	Solution	30.16	140	139.00	0.71
instance n=1000 303.alb	1	1	Solution	30.16	140	138.00	1.43
instance n=1000 304.alb	1	1	Solution	30.13	137	136.00	0.73
instance n=1000 305.alb	1	1	Solution	30.14	141	139.00	1.42
instance n=1000 306.alb	1	1	Solution	30.14	136	135.00	0.74
instance n=1000 307.alb	1	1	Solution	30.12	137	135.00	1.46
instance n=1000 308.alb	1	1	Solution	30.12	138	137.00	0.72
instance n=1000 309.alb	1	1	Solution	30.12	136	134.00	1.47
instance n=1000 31.alb	1	1	Solution	30.11	548	505.00	7.85
instance n=1000 310.alb	1	1	Solution	30.14	143	141.00	1.40
instance n=1000 311.alb	1	1	Solution	30.13	140	139.00	0.71
instance n=1000 312.alb	1	1	Solution	30.12	136	135.00	0.74
instance n=1000 313.alb	1	1	Solution	30.15	139	138.00	0.72
instance n=1000 314.alb	1	1	Solution	30.11	143	141.00	1.40
instance n=1000 315.alb	1	1	Solution	30.10	138	136.00	1.45
instance n=1000 316.alb	1	1	Solution	30.14	138	137.00	0.72
instance n=1000 317.alb	1	1	Solution	30.14	137	136.00	0.73
instance n=1000 318.alb	1	1	Solution	30.13	139	137.00	1.44
instance n=1000 319.alb	1	1	Solution	30.33	141	140.00	0.71
instance n=1000 32.alb	1	1	Solution	30.12	536	502.00	6.34
instance n=1000 320.alb	1	1	Solution	30.12	142	141.00	0.70
instance n=1000 321.alb	1	1	Solution	30.10	141	140.00	0.71
instance n=1000 322.alb	1	1	Solution	30.15	140	138.00	1.43
instance n=1000 323.alb	1	1	Solution	30.13	139	138.00	0.72
instance n=1000 324.alb	1	1	Solution	30.15	141	140.00	0.71
instance n=1000 325.alb	1	1	Solution	30.18	139	138.00	0.72
instance n=1000 326.alb	1	1	Solution	30.14	537	496.00	7.64
instance n=1000 327.alb	1	1	Solution	30.13	548	502.00	8.39
instance n=1000 328.alb	1	1	Solution	30.13	538	499.00	7.25
instance n=1000 329.alb	1	1	Solution	30.15	548	502.00	8.39
instance n=1000 33.alb	1	1	Solution	30.11	544	500.00	8.09
instance n=1000 330.alb	1	1	Solution	30.12	535	497.00	7.10

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 331.alb	1	1	Solution	30.15	537	498.00	7.26
instance n=1000 332.alb	1	1	Solution	30.12	533	495.00	7.13
instance n=1000 333.alb	1	1	Solution	30.14	549	498.00	9.29
instance n=1000 334.alb	1	1	Solution	30.13	536	498.00	7.09
instance n=1000 335.alb	1	1	Solution	30.14	544	495.00	9.01
instance n=1000 336.alb	1	1	Solution	30.14	533	497.00	6.75
instance n=1000 337.alb	1	1	Solution	30.14	548	501.00	8.58
instance n=1000 338.alb	1	1	Solution	30.11	549	502.00	8.56
instance n=1000 339.alb	1	1	Solution	30.13	550	500.00	9.09
instance n=1000 34.alb	1	1	Solution	30.10	560	506.00	9.64
instance n=1000 340.alb	1	1	Solution	30.10	558	504.00	9.68
instance n=1000 341.alb	1	1	Solution	30.15	550	502.00	8.73
instance n=1000 342.alb	1	1	Solution	30.13	547	499.00	8.78
instance n=1000 343.alb	1	1	Solution	30.13	548	499.00	8.94
instance n=1000 344.alb	1	1	Solution	30.14	545	500.00	8.26
instance n=1000 345.alb	1	1	Solution	30.12	548	502.00	8.39
instance n=1000 346.alb	1	1	Solution	30.12	543	500.00	7.92
instance n=1000 347.alb	1	1	Solution	30.16	543	498.00	8.29
instance n=1000 348.alb	1	1	Solution	30.12	563	505.00	10.30
instance n=1000 349.alb	1	1	Solution	30.16	550	502.00	8.73
instance n=1000 35.alb	1	1	Solution	30.10	536	500.00	6.72
instance n=1000 350.alb	1	1	Solution	30.13	529	495.00	6.43
instance n=1000 351.alb	1	1	Solution	30.12	230	227.00	1.30
instance n=1000 352.alb	1	1	Solution	30.15	229	227.00	0.87
instance n=1000 353.alb	1	1	Solution	30.13	220	217.00	1.36
instance n=1000 354.alb	1	1	Solution	30.14	225	222.00	1.33
instance n=1000 355.alb	1	1	Solution	30.10	223	220.00	1.35
instance n=1000 356.alb	1	1	Solution	30.10	229	226.00	1.31
instance n=1000 357.alb	1	1	Solution	30.13	216	213.00	1.39
instance n=1000 358.alb	1	1	Solution	30.12	222	219.00	1.35
instance n=1000 359.alb	1	1	Solution	30.12	225	222.00	1.33
instance n=1000 36.alb	1	1	Solution	30.10	530	496.00	6.42
instance n=1000 360.alb	1	1	Solution	30.13	232	229.00	1.29
instance n=1000 361.alb	1	1	Solution	30.15	218	215.00	1.38
instance n=1000 362.alb	1	1	Solution	30.15	225	223.00	0.89
instance n=1000 363.alb	1	1	Solution	30.13	218	215.00	1.38
instance n=1000 364.alb	1	1	Solution	30.11	224	221.00	1.34
instance n=1000 365.alb	1	1	Solution	30.10	230	227.00	1.30
instance n=1000 366.alb	1	1	Solution	30.12	230	227.00	1.30
instance n=1000 367.alb	1	1	Solution	30.13	230	227.00	1.30
instance n=1000 368.alb	1	1	Solution	30.13	229	226.00	1.31
instance n=1000 369.alb	1	1	Solution	30.15	223	220.00	1.35
instance n=1000 37.alb	1	1	Solution	30.11	558	505.00	9.50
instance n=1000 370.alb	1	1	Solution	30.13	226	223.00	1.33

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 371.alb	1	1	Solution	30.12	222	219.00	1.35
instance n=1000 372.alb	1	1	Solution	30.14	233	230.00	1.29
instance n=1000 373.alb	1	1	Solution	30.14	221	218.00	1.36
instance n=1000 374.alb	1	1	Solution	30.14	221	218.00	1.36
instance n=1000 375.alb	1	1	Solution	30.13	229	226.00	1.31
instance n=1000 376.alb	1	1	Solution	30.13	134	132.00	1.49
instance n=1000 377.alb	1	1	Solution	30.10	138	136.00	1.45
instance n=1000 378.alb	1	1	Solution	30.10	136	134.00	1.47
instance n=1000 379.alb	1	1	Solution	30.11	139	137.00	1.44
instance n=1000 38.alb	1	1	Solution	30.13	552	504.00	8.70
instance n=1000 380.alb	1	1	Solution	30.12	136	134.00	1.47
instance n=1000 381.alb	1	1	Solution	30.11	139	137.00	1.44
instance n=1000 382.alb	1	1	Solution	30.15	132	131.00	0.76
instance n=1000 383.alb	1	1	Solution	30.12	140	138.00	1.43
instance n=1000 384.alb	1	1	Solution	30.71	141	139.00	1.42
instance n=1000 385.alb	1	1	Solution	30.13	138	135.00	2.17
instance n=1000 386.alb	1	1	Solution	30.13	140	139.00	0.71
instance n=1000 387.alb	1	1	Solution	30.10	139	137.00	1.44
instance n=1000 388.alb	1	1	Solution	30.13	138	136.00	1.45
instance n=1000 389.alb	1	1	Solution	30.13	137	136.00	0.73
instance n=1000 39.alb	1	1	Solution	30.12	550	506.00	8.00
instance n=1000 390.alb	1	1	Solution	30.10	137	136.00	0.73
instance n=1000 391.alb	1	1	Solution	30.12	137	135.00	1.46
instance n=1000 392.alb	1	1	Solution	30.11	137	136.00	0.73
instance n=1000 393.alb	1	1	Solution	30.10	137	136.00	0.73
instance n=1000 394.alb	1	1	Solution	30.11	140	138.00	1.43
instance n=1000 395.alb	1	1	Solution	30.12	141	139.00	1.42
instance n=1000 396.alb	1	1	Solution	30.11	138	136.00	1.45
instance n=1000 397.alb	1	1	Solution	30.15	141	140.00	0.71
instance n=1000 398.alb	1	1	Solution	30.12	136	134.00	1.47
instance n=1000 399.alb	1	1	Solution	30.12	140	138.00	1.43
instance n=1000 4.alb	1	1	Solution	30.13	139	138.00	0.72
instance n=1000 40.alb	1	1	Solution	30.14	523	495.00	5.35
instance n=1000 400.alb	1	1	Solution	30.10	142	140.00	1.41
instance n=1000 41.alb	1	1	Solution	30.08	535	499.00	6.73
instance n=1000 42.alb	1	1	Solution	30.13	527	496.00	5.88
instance n=1000 426.alb	1	1	Solution	30.09	228	224.00	1.75
instance n=1000 427.alb	1	1	Solution	30.10	234	229.00	2.14
instance n=1000 428.alb	1	1	Solution	30.12	228	223.00	2.19
instance n=1000 429.alb	1	1	Solution	30.13	239	234.00	2.09
instance n=1000 43.alb	1	1	Solution	30.19	527	495.00	6.07
instance n=1000 430.alb	1	1	Solution	30.11	224	219.00	2.23
instance n=1000 431.alb	1	1	Solution	30.12	234	229.00	2.14
instance n=1000 432.alb	1	1	Solution	30.12	232	227.00	2.16

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 433.alb	1	1	Solution	30.14	233	229.00	1.72
instance n=1000 434.alb	1	1	Solution	30.13	215	211.00	1.86
instance n=1000 435.alb	1	1	Solution	30.11	231	226.00	2.16
instance n=1000 436.alb	1	1	Solution	30.10	231	226.00	2.16
instance n=1000 437.alb	1	1	Solution	30.13	225	221.00	1.78
instance n=1000 438.alb	1	1	Solution	30.14	225	221.00	1.78
instance n=1000 439.alb	1	1	Solution	30.14	229	225.00	1.75
instance n=1000 44.alb	1	1	Solution	30.10	548	501.00	8.58
instance n=1000 440.alb	1	1	Solution	30.12	229	225.00	1.75
instance n=1000 441.alb	1	1	Solution	30.12	225	221.00	1.78
instance n=1000 442.alb	1	1	Solution	30.13	235	230.00	2.13
instance n=1000 443.alb	1	1	Solution	30.11	220	217.00	1.36
instance n=1000 444.alb	1	1	Solution	30.15	226	222.00	1.77
instance n=1000 445.alb	1	1	Solution	30.14	234	229.00	2.14
instance n=1000 446.alb	1	1	Solution	30.10	232	228.00	1.72
instance n=1000 447.alb	1	1	Solution	30.11	225	221.00	1.78
instance n=1000 448.alb	1	1	Solution	30.12	226	222.00	1.77
instance n=1000 449.alb	1	1	Solution	30.10	237	232.00	2.11
instance n=1000 45.alb	1	1	Solution	30.12	517	491.00	5.03
instance n=1000 450.alb	1	1	Solution	30.14	224	220.00	1.79
instance n=1000 451.alb	1	1	Solution	30.18	139	136.00	2.16
instance n=1000 452.alb	1	1	Solution	30.20	134	132.00	1.49
instance n=1000 453.alb	1	1	Solution	30.22	141	138.00	2.13
instance n=1000 454.alb	1	1	Solution	30.23	142	139.00	2.11
instance n=1000 455.alb	1	1	Solution	30.13	139	136.00	2.16
instance n=1000 456.alb	1	1	Solution	30.16	137	135.00	1.46
instance n=1000 457.alb	1	1	Solution	30.08	139	137.00	1.44
instance n=1000 458.alb	1	1	Solution	30.09	137	134.00	2.19
instance n=1000 459.alb	1	1	Solution	30.19	140	137.00	2.14
instance n=1000 46.alb	1	1	Solution	30.14	533	497.00	6.75
instance n=1000 460.alb	1	1	Solution	30.15	140	137.00	2.14
instance n=1000 461.alb	1	1	Solution	30.06	139	137.00	1.44
instance n=1000 462.alb	1	1	Solution	30.17	138	136.00	1.45
instance n=1000 463.alb	1	1	Solution	30.24	138	136.00	1.45
instance n=1000 464.alb	1	1	Solution	30.09	141	138.00	2.13
instance n=1000 465.alb	1	1	Solution	30.18	141	138.00	2.13
instance n=1000 466.alb	1	1	Solution	30.20	136	133.00	2.21
instance n=1000 467.alb	1	1	Solution	30.19	140	138.00	1.43
instance n=1000 468.alb	1	1	Solution	30.09	140	136.00	2.86
instance n=1000 469.alb	1	1	Solution	30.09	140	137.00	2.14
instance n=1000 47.alb	1	1	Solution	30.09	532	498.00	6.39
instance n=1000 470.alb	1	1	Solution	30.11	137	135.00	1.46
instance n=1000 471.alb	1	1	Solution	30.19	138	135.00	2.17
instance n=1000 472.alb	1	1	Solution	30.17	143	140.00	2.10

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 473.alb	1	1	Solution	30.17	137	135.00	1.46
instance n=1000 474.alb	1	1	Solution	30.19	139	136.00	2.16
instance n=1000 475.alb	1	1	Solution	30.18	139	136.00	2.16
instance n=1000 48.alb	1	1	Solution	30.13	562	507.00	9.79
instance n=1000 49.alb	1	1	Solution	30.65	538	499.00	7.25
instance n=1000 5.alb	1	1	Solution	30.12	136	135.00	0.74
instance n=1000 50.alb	1	1	Solution	30.16	519	492.00	5.20
instance n=1000 501.alb	1	1	Solution	30.19	234	227.00	2.99
instance n=1000 502.alb	1	1	Solution	30.07	230	224.00	2.61
instance n=1000 503.alb	1	1	Solution	30.09	231	224.00	3.03
instance n=1000 504.alb	1	1	Solution	30.10	235	227.00	3.40
instance n=1000 505.alb	1	1	Solution	30.11	220	213.00	3.18
instance n=1000 506.alb	1	1	Solution	30.14	230	222.00	3.48
instance n=1000 507.alb	1	1	Solution	30.22	228	220.00	3.51
instance n=1000 508.alb	1	1	Solution	30.21	225	218.00	3.11
instance n=1000 509.alb	1	1	Solution	30.18	231	225.00	2.60
instance n=1000 51.alb	1	1	Solution	30.12	229	226.00	1.31
instance n=1000 510.alb	1	1	Solution	30.12	234	226.00	3.42
instance n=1000 511.alb	1	1	Solution	30.19	238	230.00	3.36
instance n=1000 512.alb	1	1	Solution	30.22	226	219.00	3.10
instance n=1000 513.alb	1	1	Solution	30.05	226	219.00	3.10
instance n=1000 514.alb	1	1	Solution	30.13	234	226.00	3.42
instance n=1000 515.alb	1	1	Solution	30.12	227	221.00	2.64
instance n=1000 516.alb	1	1	Solution	30.13	237	229.00	3.38
instance n=1000 517.alb	1	1	Solution	30.20	228	221.00	3.07
instance n=1000 518.alb	1	1	Solution	30.10	226	219.00	3.10
instance n=1000 519.alb	1	1	Solution	30.15	232	221.00	4.74
instance n=1000 52.alb	1	1	Solution	30.14	230	228.00	0.87
instance n=1000 520.alb	1	1	Solution	30.09	232	225.00	3.02
instance n=1000 521.alb	1	1	Solution	30.10	236	228.00	3.39
instance n=1000 522.alb	1	1	Solution	30.11	222	215.00	3.15
instance n=1000 523.alb	1	1	Solution	30.18	227	220.00	3.08
instance n=1000 524.alb	1	1	Solution	30.07	233	225.00	3.43
instance n=1000 525.alb	1	1	Solution	30.20	229	221.00	3.49
instance n=1000 53.alb	1	1	Solution	30.09	229	227.00	0.87
instance n=1000 54.alb	1	1	Solution	30.12	222	219.00	1.35
instance n=1000 55.alb	1	1	Solution	30.11	219	217.00	0.91
instance n=1000 56.alb	1	1	Solution	30.14	230	227.00	1.30
instance n=1000 57.alb	1	1	Solution	30.13	226	223.00	1.33
instance n=1000 58.alb	1	1	Solution	30.15	226	223.00	1.33
instance n=1000 59.alb	1	1	Solution	30.12	225	223.00	0.89
instance n=1000 6.alb	1	1	Solution	30.12	143	141.00	1.40
instance n=1000 60.alb	1	1	Solution	30.13	232	230.00	0.86
instance n=1000 61.alb	1	1	Solution	30.12	232	229.00	1.29

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=1000 62.alb	1	1	Solution	30.13	225	223.00	0.89
instance n=1000 63.alb	1	1	Solution	30.10	229	226.00	1.31
instance n=1000 64.alb	1	1	Solution	30.14	231	229.00	0.87
instance n=1000 65.alb	1	1	Solution	30.12	227	224.00	1.32
instance n=1000 66.alb	1	1	Solution	30.12	229	226.00	1.31
instance n=1000 67.alb	1	1	Solution	30.11	225	223.00	0.89
instance n=1000 68.alb	1	1	Solution	30.13	228	226.00	0.88
instance n=1000 69.alb	1	1	Solution	30.13	226	223.00	1.33
instance n=1000 7.alb	1	1	Solution	30.12	137	136.00	0.73
instance n=1000 70.alb	1	1	Solution	30.13	230	228.00	0.87
instance n=1000 71.alb	1	1	Solution	30.13	232	230.00	0.86
instance n=1000 72.alb	1	1	Solution	30.10	224	222.00	0.89
instance n=1000 73.alb	1	1	Solution	30.12	223	221.00	0.90
instance n=1000 74.alb	1	1	Solution	30.14	229	227.00	0.87
instance n=1000 75.alb	1	1	Solution	30.10	229	227.00	0.87
instance n=1000 77.alb	1	1	Solution	30.12	137	136.00	0.73
instance n=1000 79.alb	1	1	Solution	30.15	143	142.00	0.70
instance n=1000 8.alb	1	1	Solution	30.09	139	138.00	0.72
instance n=1000 80.alb	1	1	Solution	30.10	141	140.00	0.71
instance n=1000 81.alb	1	1	Solution	30.09	137	136.00	0.73
instance n=1000 82.alb	1	1	Solution	30.12	137	136.00	0.73
instance n=1000 83.alb	1	1	Solution	30.14	141	139.00	1.42
instance n=1000 84.alb	1	1	Solution	30.12	136	135.00	0.74
instance n=1000 85.alb	1	1	Solution	30.10	137	136.00	0.73
instance n=1000 86.alb	1	1	Solution	30.14	140	138.00	1.43
instance n=1000 88.alb	1	1	Solution	30.07	141	140.00	0.71
instance n=1000 89.alb	1	1	Solution	30.10	141	140.00	0.71
instance n=1000 9.alb	1	1	Solution	30.14	135	134.00	0.74
instance n=1000 96.alb	1	1	Solution	30.11	138	137.00	0.72
instance n=1000 97.alb	1	1	Solution	30.12	139	138.00	0.72
instance n=100 1.alb	1	1	Solution	30.15	24	23.00	4.17
instance n=100 10.alb	1	1	Solution	30.14	22	22.00	0.00
instance n=100 100.alb	1	1	Solution	30.11	25	25.00	0.00
instance n=100 101.alb	1	1	Solution	30.13	15	15.00	0.00
instance n=100 102.alb	1	1	Solution	30.17	14	14.00	0.00
instance n=100 103.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 104.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 105.alb	1	1	Solution	30.13	13	13.00	0.00
instance n=100 106.alb	1	1	Optimal	26.21	14	14.00	0.00
instance n=100 107.alb	1	1	Solution	30.15	14	14.00	0.00
instance n=100 108.alb	1	1	Solution	30.13	15	14.00	6.67
instance n=100 109.alb	1	1	Solution	30.11	15	15.00	0.00
instance n=100 11.alb	1	1	Solution	30.18	24	24.00	0.00
instance n=100 110.alb	1	1	Solution	30.14	13	13.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 111.alb	1	1	Solution	30.13	16	16.00	0.00
instance n=100 112.alb	1	1	Solution	30.13	13	13.00	0.00
instance n=100 113.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 114.alb	1	1	Solution	30.12	13	13.00	0.00
instance n=100 115.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 116.alb	1	1	Solution	30.15	16	16.00	0.00
instance n=100 117.alb	1	1	Solution	30.16	16	15.00	6.25
instance n=100 118.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 119.alb	1	1	Solution	30.19	14	14.00	0.00
instance n=100 12.alb	1	1	Solution	30.13	25	25.00	0.00
instance n=100 120.alb	1	1	Solution	30.16	14	14.00	0.00
instance n=100 121.alb	1	1	Solution	30.15	15	15.00	0.00
instance n=100 122.alb	1	1	Solution	30.13	13	13.00	0.00
instance n=100 123.alb	1	1	Solution	30.14	15	15.00	0.00
instance n=100 124.alb	1	1	Solution	30.17	16	15.00	6.25
instance n=100 125.alb	1	1	Solution	30.15	14	14.00	0.00
instance n=100 126.alb	1	1	Solution	30.10	52	49.00	5.77
instance n=100 127.alb	1	1	Solution	30.16	55	49.00	10.91
instance n=100 128.alb	1	1	Solution	30.14	58	52.00	10.34
instance n=100 129.alb	1	1	Solution	30.12	56	50.00	10.71
instance n=100 13.alb	1	1	Solution	30.14	24	24.00	0.00
instance n=100 130.alb	1	1	Solution	30.08	55	51.00	7.27
instance n=100 131.alb	1	1	Solution	30.11	54	50.00	7.41
instance n=100 132.alb	1	1	Solution	30.11	59	52.00	11.86
instance n=100 133.alb	1	1	Solution	30.17	57	51.00	10.53
instance n=100 134.alb	1	1	Solution	30.12	56	51.00	8.93
instance n=100 135.alb	1	1	Solution	30.12	58	51.00	12.07
instance n=100 136.alb	1	1	Solution	30.14	56	49.00	12.50
instance n=100 137.alb	1	1	Solution	30.13	57	50.00	12.28
instance n=100 138.alb	1	1	Solution	30.17	58	52.00	10.34
instance n=100 139.alb	1	1	Solution	30.14	52	49.00	5.77
instance n=100 14.alb	1	1	Solution	30.14	20	20.00	0.00
instance n=100 140.alb	1	1	Solution	30.15	56	51.00	8.93
instance n=100 141.alb	1	1	Solution	30.14	52	49.00	5.77
instance n=100 142.alb	1	1	Solution	30.13	55	50.00	9.09
instance n=100 143.alb	1	1	Solution	30.09	55	50.00	9.09
instance n=100 144.alb	1	1	Solution	30.08	49	47.00	4.08
instance n=100 145.alb	1	1	Solution	30.13	59	51.00	13.56
instance n=100 146.alb	1	1	Solution	30.10	53	50.00	5.66
instance n=100 147.alb	1	1	Solution	30.12	61	52.00	14.75
instance n=100 148.alb	1	1	Solution	30.16	55	50.00	9.09
instance n=100 149.alb	1	1	Solution	30.19	56	51.00	8.93
instance n=100 15.alb	1	1	Solution	30.12	24	24.00	0.00
instance n=100 150.alb	1	1	Solution	30.13	59	51.00	13.56

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 151.alb	1	1	Solution	30.14	22	21.00	4.55
instance n=100 152.alb	1	1	Solution	30.11	22	22.00	0.00
instance n=100 153.alb	1	1	Solution	30.16	21	21.00	0.00
instance n=100 154.alb	1	1	Solution	30.21	25	25.00	0.00
instance n=100 155.alb	1	1	Solution	30.12	22	22.00	0.00
instance n=100 156.alb	1	1	Solution	30.16	23	23.00	0.00
instance n=100 157.alb	1	1	Solution	30.16	26	26.00	0.00
instance n=100 158.alb	1	1	Solution	30.21	23	23.00	0.00
instance n=100 159.alb	1	1	Solution	30.18	19	19.00	0.00
instance n=100 16.alb	1	1	Solution	30.13	23	23.00	0.00
instance n=100 160.alb	1	1	Solution	30.13	22	22.00	0.00
instance n=100 161.alb	1	1	Solution	30.17	23	22.00	4.35
instance n=100 162.alb	1	1	Solution	30.12	23	22.00	4.35
instance n=100 163.alb	1	1	Solution	30.15	25	25.00	0.00
instance n=100 164.alb	1	1	Solution	30.15	23	23.00	0.00
instance n=100 165.alb	1	1	Solution	30.16	25	24.00	4.00
instance n=100 166.alb	1	1	Solution	30.15	24	24.00	0.00
instance n=100 167.alb	1	1	Solution	30.11	22	22.00	0.00
instance n=100 168.alb	1	1	Solution	30.12	22	21.00	4.55
instance n=100 169.alb	1	1	Solution	30.18	21	21.00	0.00
instance n=100 17.alb	1	1	Solution	30.16	22	21.00	4.55
instance n=100 170.alb	1	1	Solution	30.14	24	24.00	0.00
instance n=100 171.alb	1	1	Solution	30.15	25	24.00	4.00
instance n=100 172.alb	1	1	Solution	30.14	24	24.00	0.00
instance n=100 173.alb	1	1	Solution	30.13	25	24.00	4.00
instance n=100 174.alb	1	1	Solution	30.19	23	22.00	4.35
instance n=100 175.alb	1	1	Solution	30.12	27	26.00	3.70
instance n=100 176.alb	1	1	Solution	30.14	13	13.00	0.00
instance n=100 177.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 178.alb	1	1	Solution	30.11	15	15.00	0.00
instance n=100 179.alb	1	1	Solution	30.14	15	15.00	0.00
instance n=100 18.alb	1	1	Solution	30.16	20	19.00	5.00
instance n=100 180.alb	1	1	Solution	30.17	15	15.00	0.00
instance n=100 181.alb	1	1	Solution	30.16	13	13.00	0.00
instance n=100 182.alb	1	1	Solution	30.13	15	15.00	0.00
instance n=100 183.alb	1	1	Solution	30.24	14	14.00	0.00
instance n=100 184.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 185.alb	1	1	Solution	30.25	15	15.00	0.00
instance n=100 186.alb	1	1	Solution	30.11	14	14.00	0.00
instance n=100 187.alb	1	1	Solution	30.15	14	13.00	7.14
instance n=100 188.alb	1	1	Solution	30.12	16	16.00	0.00
instance n=100 189.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 19.alb	1	1	Solution	30.14	23	23.00	0.00
instance n=100 190.alb	1	1	Solution	30.15	13	13.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 191.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 192.alb	1	1	Solution	30.18	13	13.00	0.00
instance n=100 193.alb	1	1	Solution	30.18	15	15.00	0.00
instance n=100 194.alb	1	1	Solution	30.14	15	15.00	0.00
instance n=100 195.alb	1	1	Solution	30.14	15	15.00	0.00
instance n=100 196.alb	1	1	Solution	30.11	15	15.00	0.00
instance n=100 197.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 198.alb	1	1	Solution	30.14	13	13.00	0.00
instance n=100 199.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 2.alb	1	1	Solution	30.17	21	21.00	0.00
instance n=100 20.alb	1	1	Solution	30.18	21	21.00	0.00
instance n=100 200.alb	1	1	Solution	30.24	15	15.00	0.00
instance n=100 201.alb	1	1	Solution	30.15	55	50.00	9.09
instance n=100 202.alb	1	1	Solution	30.17	65	52.00	20.00
instance n=100 203.alb	1	1	Solution	30.17	53	49.00	7.55
instance n=100 204.alb	1	1	Solution	30.18	51	48.00	5.88
instance n=100 205.alb	1	1	Solution	30.20	58	51.00	12.07
instance n=100 206.alb	1	1	Solution	30.13	53	49.00	7.55
instance n=100 207.alb	1	1	Solution	30.16	53	49.00	7.55
instance n=100 208.alb	1	1	Solution	30.15	59	51.00	13.56
instance n=100 209.alb	1	1	Solution	30.13	58	51.00	12.07
instance n=100 21.alb	1	1	Solution	30.19	21	21.00	0.00
instance n=100 210.alb	1	1	Solution	30.12	54	49.00	9.26
instance n=100 211.alb	1	1	Solution	30.15	52	49.00	5.77
instance n=100 212.alb	1	1	Solution	30.13	54	50.00	7.41
instance n=100 213.alb	1	1	Solution	30.13	55	50.00	9.09
instance n=100 214.alb	1	1	Solution	30.13	56	50.00	10.71
instance n=100 215.alb	1	1	Solution	30.19	51	47.00	7.84
instance n=100 216.alb	1	1	Solution	30.25	55	50.00	9.09
instance n=100 217.alb	1	1	Solution	4857.56	54	49.00	9.26
instance n=100 218.alb	1	1	Solution	30.11	56	50.00	10.71
instance n=100 219.alb	1	1	Solution	30.12	54	49.00	9.26
instance n=100 22.alb	1	1	Solution	30.13	25	24.00	4.00
instance n=100 220.alb	1	1	Solution	30.15	55	50.00	9.09
instance n=100 221.alb	1	1	Solution	30.10	59	51.00	13.56
instance n=100 222.alb	1	1	Solution	30.19	55	50.00	9.09
instance n=100 223.alb	1	1	Solution	30.20	52	49.00	5.77
instance n=100 224.alb	1	1	Solution	30.17	57	51.00	10.53
instance n=100 225.alb	1	1	Solution	30.15	55	50.00	9.09
instance n=100 226.alb	1	1	Solution	30.10	25	24.00	4.00
instance n=100 227.alb	1	1	Solution	30.13	27	26.00	3.70
instance n=100 228.alb	1	1	Solution	30.11	22	22.00	0.00
instance n=100 229.alb	1	1	Solution	30.11	24	24.00	0.00
instance n=100 23.alb	1	1	Solution	30.15	24	24.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 230.alb	1	1	Solution	30.10	24	23.00	4.17
instance n=100 231.alb	1	1	Solution	30.12	22	22.00	0.00
instance n=100 232.alb	1	1	Solution	30.12	22	22.00	0.00
instance n=100 233.alb	1	1	Solution	30.16	23	22.00	4.35
instance n=100 234.alb	1	1	Solution	30.26	23	23.00	0.00
instance n=100 235.alb	1	1	Solution	30.16	26	26.00	0.00
instance n=100 236.alb	1	1	Solution	30.14	23	22.00	4.35
instance n=100 237.alb	1	1	Solution	30.11	23	23.00	0.00
instance n=100 238.alb	1	1	Solution	30.10	23	23.00	0.00
instance n=100 239.alb	1	1	Solution	30.11	21	21.00	0.00
instance n=100 24.alb	1	1	Solution	30.13	24	24.00	0.00
instance n=100 240.alb	1	1	Solution	30.17	22	22.00	0.00
instance n=100 241.alb	1	1	Solution	30.19	23	22.00	4.35
instance n=100 242.alb	1	1	Solution	30.15	23	23.00	0.00
instance n=100 243.alb	1	1	Solution	30.10	24	23.00	4.17
instance n=100 244.alb	1	1	Solution	30.14	21	21.00	0.00
instance n=100 245.alb	1	1	Solution	30.13	24	23.00	4.17
instance n=100 246.alb	1	1	Solution	30.14	27	26.00	3.70
instance n=100 247.alb	1	1	Solution	30.14	23	22.00	4.35
instance n=100 248.alb	1	1	Solution	30.14	20	19.00	5.00
instance n=100 249.alb	1	1	Solution	30.11	21	21.00	0.00
instance n=100 25.alb	1	1	Solution	30.16	22	22.00	0.00
instance n=100 250.alb	1	1	Solution	30.18	24	24.00	0.00
instance n=100 251.alb	1	1	Solution	30.11	15	15.00	0.00
instance n=100 252.alb	1	1	Solution	30.15	14	14.00	0.00
instance n=100 253.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 254.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 255.alb	1	1	Optimal	30.03	14	14.00	0.00
instance n=100 256.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 257.alb	1	1	Solution	30.14	12	12.00	0.00
instance n=100 258.alb	1	1	Solution	30.15	15	14.00	6.67
instance n=100 259.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 26.alb	1	1	Solution	30.15	14	14.00	0.00
instance n=100 260.alb	1	1	Solution	30.09	15	15.00	0.00
instance n=100 261.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 262.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 263.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 264.alb	1	1	Solution	30.10	15	15.00	0.00
instance n=100 265.alb	1	1	Solution	30.10	14	14.00	0.00
instance n=100 266.alb	1	1	Solution	30.21	13	13.00	0.00
instance n=100 267.alb	1	1	Solution	30.13	13	13.00	0.00
instance n=100 268.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 269.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 27.alb	1	1	Solution	30.10	13	13.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 270.alb	1	1	Solution	30.23	13	13.00	0.00
instance n=100 271.alb	1	1	Solution	30.12	14	13.00	7.14
instance n=100 272.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 273.alb	1	1	Solution	30.10	13	13.00	0.00
instance n=100 274.alb	1	1	Solution	30.12	14	13.00	7.14
instance n=100 275.alb	1	1	Solution	30.13	13	13.00	0.00
instance n=100 276.alb	1	1	Solution	30.13	62	52.00	16.13
instance n=100 277.alb	1	1	Solution	30.09	61	51.00	16.39
instance n=100 278.alb	1	1	Solution	30.10	59	51.00	13.56
instance n=100 279.alb	1	1	Solution	30.16	57	50.00	12.28
instance n=100 28.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 280.alb	1	1	Solution	30.09	57	50.00	12.28
instance n=100 281.alb	1	1	Solution	30.08	64	53.00	17.19
instance n=100 282.alb	1	1	Solution	30.15	63	52.00	17.46
instance n=100 283.alb	1	1	Solution	30.10	57	50.00	12.28
instance n=100 284.alb	1	1	Solution	30.10	56	50.00	10.71
instance n=100 285.alb	1	1	Solution	30.09	57	50.00	12.28
instance n=100 286.alb	1	1	Solution	30.12	59	51.00	13.56
instance n=100 287.alb	1	1	Solution	30.10	57	50.00	12.28
instance n=100 288.alb	1	1	Solution	30.17	60	51.00	15.00
instance n=100 289.alb	1	1	Solution	30.11	64	52.00	18.75
instance n=100 29.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 290.alb	1	1	Solution	30.12	57	50.00	12.28
instance n=100 291.alb	1	1	Solution	30.11	55	49.00	10.91
instance n=100 292.alb	1	1	Solution	30.11	60	51.00	15.00
instance n=100 293.alb	1	1	Solution	30.11	55	49.00	10.91
instance n=100 294.alb	1	1	Solution	30.18	61	51.00	16.39
instance n=100 295.alb	1	1	Solution	30.09	59	51.00	13.56
instance n=100 296.alb	1	1	Solution	30.10	59	50.00	15.25
instance n=100 297.alb	1	1	Solution	30.12	61	51.00	16.39
instance n=100 298.alb	1	1	Solution	30.14	61	52.00	14.75
instance n=100 299.alb	1	1	Solution	30.09	55	50.00	9.09
instance n=100 3.alb	1	1	Solution	30.13	20	20.00	0.00
instance n=100 30.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 300.alb	1	1	Solution	30.17	55	49.00	10.91
instance n=100 301.alb	1	1	Solution	30.13	23	23.00	0.00
instance n=100 302.alb	1	1	Solution	30.18	24	24.00	0.00
instance n=100 303.alb	1	1	Solution	30.10	24	24.00	0.00
instance n=100 304.alb	1	1	Solution	30.17	21	21.00	0.00
instance n=100 305.alb	1	1	Solution	30.12	22	22.00	0.00
instance n=100 306.alb	1	1	Solution	30.13	24	24.00	0.00
instance n=100 307.alb	1	1	Solution	30.18	24	23.00	4.17
instance n=100 308.alb	1	1	Solution	30.13	21	20.00	4.76
instance n=100 309.alb	1	1	Solution	30.17	22	21.00	4.55

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 31.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 310.alb	1	1	Solution	30.15	23	23.00	0.00
instance n=100 311.alb	1	1	Solution	30.20	21	21.00	0.00
instance n=100 312.alb	1	1	Solution	30.18	22	22.00	0.00
instance n=100 313.alb	1	1	Solution	30.16	23	23.00	0.00
instance n=100 314.alb	1	1	Solution	30.15	19	19.00	0.00
instance n=100 315.alb	1	1	Solution	30.15	23	22.00	4.35
instance n=100 316.alb	1	1	Solution	30.13	24	24.00	0.00
instance n=100 317.alb	1	1	Solution	30.12	26	26.00	0.00
instance n=100 318.alb	1	1	Solution	30.12	21	21.00	0.00
instance n=100 319.alb	1	1	Solution	30.12	23	23.00	0.00
instance n=100 32.alb	1	1	Solution	30.15	14	14.00	0.00
instance n=100 320.alb	1	1	Solution	30.13	22	22.00	0.00
instance n=100 321.alb	1	1	Solution	30.14	26	26.00	0.00
instance n=100 322.alb	1	1	Solution	30.18	24	23.00	4.17
instance n=100 323.alb	1	1	Solution	30.12	24	24.00	0.00
instance n=100 324.alb	1	1	Solution	30.16	23	23.00	0.00
instance n=100 325.alb	1	1	Solution	30.25	26	25.00	3.85
instance n=100 326.alb	1	1	Solution	30.13	13	13.00	0.00
instance n=100 327.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 328.alb	1	1	Solution	30.14	15	14.00	6.67
instance n=100 329.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 33.alb	1	1	Solution	30.14	15	15.00	0.00
instance n=100 330.alb	1	1	Solution	30.16	15	14.00	6.67
instance n=100 331.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 332.alb	1	1	Solution	30.15	14	14.00	0.00
instance n=100 333.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 334.alb	1	1	Solution	30.11	14	14.00	0.00
instance n=100 335.alb	1	1	Solution	30.13	13	13.00	0.00
instance n=100 336.alb	1	1	Solution	30.16	15	15.00	0.00
instance n=100 337.alb	1	1	Solution	30.14	13	13.00	0.00
instance n=100 338.alb	1	1	Solution	30.14	15	14.00	6.67
instance n=100 339.alb	1	1	Solution	30.11	14	14.00	0.00
instance n=100 34.alb	1	1	Solution	30.13	15	15.00	0.00
instance n=100 340.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 341.alb	1	1	Solution	30.11	16	16.00	0.00
instance n=100 342.alb	1	1	Solution	30.20	14	14.00	0.00
instance n=100 343.alb	1	1	Solution	30.13	16	16.00	0.00
instance n=100 344.alb	1	1	Solution	30.14	15	15.00	0.00
instance n=100 345.alb	1	1	Solution	30.19	14	14.00	0.00
instance n=100 346.alb	1	1	Solution	30.16	14	14.00	0.00
instance n=100 347.alb	1	1	Solution	30.17	14	14.00	0.00
instance n=100 348.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 349.alb	1	1	Solution	30.13	13	13.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 35.alb	1	1	Solution	30.13	15	15.00	0.00
instance n=100 350.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 351.alb	1	1	Solution	30.14	61	52.00	14.75
instance n=100 352.alb	1	1	Solution	30.14	64	52.00	18.75
instance n=100 353.alb	1	1	Solution	30.15	52	49.00	5.77
instance n=100 354.alb	1	1	Solution	30.15	53	49.00	7.55
instance n=100 355.alb	1	1	Solution	30.14	57	51.00	10.53
instance n=100 356.alb	1	1	Solution	30.13	61	53.00	13.11
instance n=100 357.alb	1	1	Solution	30.15	54	50.00	7.41
instance n=100 358.alb	1	1	Solution	30.16	53	50.00	5.66
instance n=100 359.alb	1	1	Solution	30.13	53	50.00	5.66
instance n=100 36.alb	1	1	Solution	30.20	15	14.00	6.67
instance n=100 360.alb	1	1	Solution	30.12	57	51.00	10.53
instance n=100 361.alb	1	1	Solution	30.23	52	49.00	5.77
instance n=100 362.alb	1	1	Solution	30.22	59	51.00	13.56
instance n=100 363.alb	1	1	Solution	30.11	53	50.00	5.66
instance n=100 364.alb	1	1	Solution	30.11	53	50.00	5.66
instance n=100 365.alb	1	1	Solution	30.15	56	50.00	10.71
instance n=100 366.alb	1	1	Solution	30.18	62	53.00	14.52
instance n=100 367.alb	1	1	Solution	30.15	58	51.00	12.07
instance n=100 368.alb	1	1	Solution	30.16	60	52.00	13.33
instance n=100 369.alb	1	1	Solution	30.16	53	49.00	7.55
instance n=100 37.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 370.alb	1	1	Solution	30.10	60	52.00	13.33
instance n=100 371.alb	1	1	Solution	30.18	55	50.00	9.09
instance n=100 372.alb	1	1	Solution	30.17	50	47.00	6.00
instance n=100 373.alb	1	1	Solution	30.13	53	49.00	7.55
instance n=100 374.alb	1	1	Solution	30.15	52	50.00	3.85
instance n=100 375.alb	1	1	Solution	30.16	60	52.00	13.33
instance n=100 376.alb	1	1	Solution	30.09	23	23.00	0.00
instance n=100 377.alb	1	1	Solution	30.14	21	20.00	4.76
instance n=100 378.alb	1	1	Solution	30.17	22	22.00	0.00
instance n=100 379.alb	1	1	Solution	30.10	24	23.00	4.17
instance n=100 38.alb	1	1	Solution	30.15	14	14.00	0.00
instance n=100 380.alb	1	1	Solution	30.12	23	22.00	4.35
instance n=100 381.alb	1	1	Solution	30.13	24	24.00	0.00
instance n=100 382.alb	1	1	Solution	30.11	26	25.00	3.85
instance n=100 383.alb	1	1	Solution	30.11	25	25.00	0.00
instance n=100 384.alb	1	1	Solution	30.16	25	25.00	0.00
instance n=100 385.alb	1	1	Solution	30.14	22	22.00	0.00
instance n=100 386.alb	1	1	Solution	30.16	24	23.00	4.17
instance n=100 387.alb	1	1	Solution	30.14	22	22.00	0.00
instance n=100 388.alb	1	1	Solution	30.13	26	25.00	3.85
instance n=100 389.alb	1	1	Solution	30.16	23	23.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 39.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 390.alb	1	1	Solution	30.12	23	22.00	4.35
instance n=100 391.alb	1	1	Solution	30.15	20	20.00	0.00
instance n=100 392.alb	1	1	Solution	30.10	22	22.00	0.00
instance n=100 393.alb	1	1	Solution	30.12	24	23.00	4.17
instance n=100 394.alb	1	1	Solution	30.18	22	22.00	0.00
instance n=100 395.alb	1	1	Solution	30.11	24	24.00	0.00
instance n=100 396.alb	1	1	Solution	30.08	20	20.00	0.00
instance n=100 397.alb	1	1	Solution	30.13	26	25.00	3.85
instance n=100 398.alb	1	1	Solution	30.17	25	24.00	4.00
instance n=100 399.alb	1	1	Solution	30.20	23	23.00	0.00
instance n=100 4.alb	1	1	Solution	30.14	24	24.00	0.00
instance n=100 40.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 400.alb	1	1	Solution	30.11	24	24.00	0.00
instance n=100 401.alb	1	1	Solution	30.11	15	15.00	0.00
instance n=100 402.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 403.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 404.alb	1	1	Solution	30.14	15	15.00	0.00
instance n=100 405.alb	1	1	Solution	30.10	13	13.00	0.00
instance n=100 406.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 407.alb	1	1	Solution	30.17	15	15.00	0.00
instance n=100 408.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 409.alb	1	1	Solution	30.10	15	15.00	0.00
instance n=100 41.alb	1	1	Solution	30.18	13	13.00	0.00
instance n=100 410.alb	1	1	Solution	30.15	14	14.00	0.00
instance n=100 411.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 412.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 413.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 414.alb	1	1	Solution	30.16	15	14.00	6.67
instance n=100 415.alb	1	1	Solution	30.12	13	13.00	0.00
instance n=100 416.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 417.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 418.alb	1	1	Solution	30.11	16	16.00	0.00
instance n=100 419.alb	1	1	Solution	30.13	15	14.00	6.67
instance n=100 42.alb	1	1	Solution	30.17	14	14.00	0.00
instance n=100 420.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 421.alb	1	1	Solution	30.16	14	14.00	0.00
instance n=100 422.alb	1	1	Solution	30.12	15	15.00	0.00
instance n=100 423.alb	1	1	Solution	30.22	14	14.00	0.00
instance n=100 424.alb	1	1	Solution	30.13	14	14.00	0.00
instance n=100 425.alb	1	1	Solution	30.09	15	15.00	0.00
instance n=100 426.alb	1	1	Solution	30.10	62	53.00	14.52
instance n=100 427.alb	1	1	Solution	30.10	59	50.00	15.25
instance n=100 428.alb	1	1	Solution	30.10	57	50.00	12.28

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 429.alb	1	1	Solution	30.10	60	52.00	13.33
instance n=100 43.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 430.alb	1	1	Solution	30.12	56	50.00	10.71
instance n=100 431.alb	1	1	Solution	30.10	55	50.00	9.09
instance n=100 432.alb	1	1	Solution	30.19	58	50.00	13.79
instance n=100 433.alb	1	1	Solution	30.14	54	49.00	9.26
instance n=100 434.alb	1	1	Solution	30.14	59	51.00	13.56
instance n=100 435.alb	1	1	Solution	30.10	58	51.00	12.07
instance n=100 436.alb	1	1	Solution	30.08	53	48.00	9.43
instance n=100 437.alb	1	1	Solution	30.12	55	50.00	9.09
instance n=100 438.alb	1	1	Solution	30.07	57	51.00	10.53
instance n=100 439.alb	1	1	Solution	30.10	57	51.00	10.53
instance n=100 44.alb	1	1	Solution	30.11	14	14.00	0.00
instance n=100 440.alb	1	1	Solution	30.12	55	49.00	10.91
instance n=100 441.alb	1	1	Solution	30.09	56	50.00	10.71
instance n=100 442.alb	1	1	Solution	30.22	55	48.00	12.73
instance n=100 443.alb	1	1	Solution	30.10	57	50.00	12.28
instance n=100 444.alb	1	1	Solution	30.11	55	50.00	9.09
instance n=100 445.alb	1	1	Solution	30.09	57	51.00	10.53
instance n=100 446.alb	1	1	Solution	30.12	59	52.00	11.86
instance n=100 447.alb	1	1	Solution	30.09	56	50.00	10.71
instance n=100 448.alb	1	1	Solution	30.12	58	51.00	12.07
instance n=100 449.alb	1	1	Solution	30.13	56	50.00	10.71
instance n=100 45.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 450.alb	1	1	Solution	30.14	56	51.00	8.93
instance n=100 451.alb	1	1	Solution	30.12	26	26.00	0.00
instance n=100 452.alb	1	1	Solution	30.09	22	22.00	0.00
instance n=100 453.alb	1	1	Solution	30.09	24	24.00	0.00
instance n=100 454.alb	1	1	Solution	30.12	23	23.00	0.00
instance n=100 455.alb	1	1	Solution	30.09	23	23.00	0.00
instance n=100 456.alb	1	1	Solution	30.09	26	26.00	0.00
instance n=100 457.alb	1	1	Solution	30.07	23	23.00	0.00
instance n=100 458.alb	1	1	Solution	30.14	24	24.00	0.00
instance n=100 459.alb	1	1	Solution	30.14	23	23.00	0.00
instance n=100 46.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 460.alb	1	1	Solution	30.11	23	23.00	0.00
instance n=100 461.alb	1	1	Solution	30.12	24	23.00	4.17
instance n=100 462.alb	1	1	Solution	30.10	23	23.00	0.00
instance n=100 463.alb	1	1	Solution	30.09	26	25.00	3.85
instance n=100 464.alb	1	1	Solution	30.09	25	25.00	0.00
instance n=100 465.alb	1	1	Solution	30.13	22	22.00	0.00
instance n=100 466.alb	1	1	Solution	30.11	26	26.00	0.00
instance n=100 467.alb	1	1	Solution	30.10	21	20.00	4.76
instance n=100 468.alb	1	1	Solution	30.09	25	24.00	4.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 469.alb	1	1	Solution	30.09	22	22.00	0.00
instance n=100 47.alb	1	1	Solution	30.18	14	14.00	0.00
instance n=100 470.alb	1	1	Solution	30.10	26	25.00	3.85
instance n=100 471.alb	1	1	Solution	30.08	26	25.00	3.85
instance n=100 472.alb	1	1	Solution	30.11	23	23.00	0.00
instance n=100 473.alb	1	1	Solution	30.10	28	28.00	0.00
instance n=100 474.alb	1	1	Solution	30.09	23	23.00	0.00
instance n=100 475.alb	1	1	Solution	30.08	24	23.00	4.17
instance n=100 476.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 477.alb	1	1	Solution	30.10	14	14.00	0.00
instance n=100 478.alb	1	1	Optimal	30.04	14	14.00	0.00
instance n=100 479.alb	1	1	Optimal	30.07	16	16.00	0.00
instance n=100 48.alb	1	1	Solution	30.11	15	15.00	0.00
instance n=100 480.alb	1	1	Optimal	13.75	15	15.00	0.00
instance n=100 481.alb	1	1	Solution	30.13	15	15.00	0.00
instance n=100 482.alb	1	1	Optimal	30.03	15	15.00	0.00
instance n=100 483.alb	1	1	Solution	30.10	14	14.00	0.00
instance n=100 484.alb	1	1	Optimal	20.71	14	14.00	0.00
instance n=100 485.alb	1	1	Optimal	19.39	16	16.00	0.00
instance n=100 486.alb	1	1	Solution	30.18	15	15.00	0.00
instance n=100 487.alb	1	1	Optimal	30.03	15	15.00	0.00
instance n=100 488.alb	1	1	Solution	30.10	16	16.00	0.00
instance n=100 489.alb	1	1	Solution	30.09	13	13.00	0.00
instance n=100 49.alb	1	1	Solution	30.12	14	14.00	0.00
instance n=100 490.alb	1	1	Solution	30.11	15	15.00	0.00
instance n=100 491.alb	1	1	Optimal	30.03	16	16.00	0.00
instance n=100 492.alb	1	1	Optimal	30.04	14	14.00	0.00
instance n=100 493.alb	1	1	Solution	30.10	14	14.00	0.00
instance n=100 494.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 495.alb	1	1	Solution	30.11	15	15.00	0.00
instance n=100 496.alb	1	1	Solution	30.07	14	14.00	0.00
instance n=100 497.alb	1	1	Solution	30.13	13	13.00	0.00
instance n=100 498.alb	1	1	Solution	30.14	14	14.00	0.00
instance n=100 499.alb	1	1	Solution	30.08	14	14.00	0.00
instance n=100 5.alb	1	1	Solution	30.13	22	22.00	0.00
instance n=100 50.alb	1	1	Solution	30.16	14	14.00	0.00
instance n=100 500.alb	1	1	Solution	30.09	14	14.00	0.00
instance n=100 501.alb	1	1	Solution	30.10	64	56.00	12.50
instance n=100 502.alb	1	1	Solution	30.09	66	54.00	18.18
instance n=100 503.alb	1	1	Solution	30.08	62	52.00	16.13
instance n=100 504.alb	1	1	Solution	30.07	60	52.00	13.33
instance n=100 505.alb	1	1	Solution	30.10	63	53.00	15.87
instance n=100 506.alb	1	1	Solution	30.14	60	51.00	15.00
instance n=100 507.alb	1	1	Solution	30.09	60	52.00	13.33

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 508.alb	1	1	Solution	30.08	56	51.00	8.93
instance n=100 509.alb	1	1	Solution	30.12	60	52.00	13.33
instance n=100 51.alb	1	1	Solution	30.16	51	48.00	5.88
instance n=100 510.alb	1	1	Solution	30.08	58	52.00	10.34
instance n=100 511.alb	1	1	Solution	30.09	60	52.00	13.33
instance n=100 512.alb	1	1	Solution	30.12	62	53.00	14.52
instance n=100 513.alb	1	1	Solution	30.11	64	51.00	20.31
instance n=100 514.alb	1	1	Solution	30.08	59	51.00	13.56
instance n=100 515.alb	1	1	Solution	30.08	64	52.00	18.75
instance n=100 516.alb	1	1	Solution	30.10	70	55.00	21.43
instance n=100 517.alb	1	1	Solution	30.11	62	53.00	14.52
instance n=100 518.alb	1	1	Solution	30.10	59	51.00	13.56
instance n=100 519.alb	1	1	Solution	30.07	63	53.00	15.87
instance n=100 52.alb	1	1	Solution	30.15	54	50.00	7.41
instance n=100 520.alb	1	1	Solution	30.11	61	51.00	16.39
instance n=100 521.alb	1	1	Solution	30.07	70	56.00	20.00
instance n=100 522.alb	1	1	Solution	30.21	60	51.00	15.00
instance n=100 523.alb	1	1	Solution	30.11	57	50.00	12.28
instance n=100 524.alb	1	1	Solution	30.13	60	51.00	15.00
instance n=100 525.alb	1	1	Solution	30.08	62	51.00	17.74
instance n=100 53.alb	1	1	Solution	30.12	53	50.00	5.66
instance n=100 54.alb	1	1	Solution	30.13	52	49.00	5.77
instance n=100 55.alb	1	1	Solution	30.15	55	50.00	9.09
instance n=100 56.alb	1	1	Solution	30.11	53	50.00	5.66
instance n=100 57.alb	1	1	Solution	30.13	56	51.00	8.93
instance n=100 58.alb	1	1	Solution	30.14	58	52.00	10.34
instance n=100 59.alb	1	1	Solution	30.18	59	51.00	13.56
instance n=100 6.alb	1	1	Solution	30.13	22	22.00	0.00
instance n=100 60.alb	1	1	Solution	30.13	55	51.00	7.27
instance n=100 61.alb	1	1	Solution	30.13	57	51.00	10.53
instance n=100 62.alb	1	1	Solution	30.13	53	49.00	7.55
instance n=100 63.alb	1	1	Solution	30.14	61	52.00	14.75
instance n=100 64.alb	1	1	Solution	30.17	57	51.00	10.53
instance n=100 65.alb	1	1	Solution	30.25	63	53.00	15.87
instance n=100 66.alb	1	1	Solution	30.16	52	49.00	5.77
instance n=100 67.alb	1	1	Solution	30.19	57	51.00	10.53
instance n=100 68.alb	1	1	Solution	30.20	57	49.00	14.04
instance n=100 69.alb	1	1	Solution	30.18	54	51.00	5.56
instance n=100 7.alb	1	1	Solution	30.11	26	26.00	0.00
instance n=100 70.alb	1	1	Solution	30.16	57	50.00	12.28
instance n=100 71.alb	1	1	Solution	30.11	54	50.00	7.41
instance n=100 72.alb	1	1	Solution	30.20	56	50.00	10.71
instance n=100 73.alb	1	1	Solution	30.12	58	52.00	10.34
instance n=100 74.alb	1	1	Solution	30.14	53	49.00	7.55

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=100 75.alb	1	1	Solution	30.12	56	51.00	8.93
instance n=100 76.alb	1	1	Solution	30.12	23	23.00	0.00
instance n=100 77.alb	1	1	Solution	30.12	20	20.00	0.00
instance n=100 78.alb	1	1	Solution	30.19	22	21.00	4.55
instance n=100 79.alb	1	1	Solution	30.14	21	21.00	0.00
instance n=100 8.alb	1	1	Solution	30.13	24	24.00	0.00
instance n=100 80.alb	1	1	Solution	30.12	23	22.00	4.35
instance n=100 81.alb	1	1	Solution	30.16	20	20.00	0.00
instance n=100 82.alb	1	1	Solution	30.15	21	21.00	0.00
instance n=100 83.alb	1	1	Solution	30.13	22	22.00	0.00
instance n=100 84.alb	1	1	Solution	30.10	27	26.00	3.70
instance n=100 85.alb	1	1	Solution	30.13	25	24.00	4.00
instance n=100 86.alb	1	1	Solution	30.14	23	23.00	0.00
instance n=100 87.alb	1	1	Solution	30.11	22	22.00	0.00
instance n=100 88.alb	1	1	Solution	30.13	24	23.00	4.17
instance n=100 89.alb	1	1	Solution	30.17	24	24.00	0.00
instance n=100 9.alb	1	1	Solution	30.15	24	23.00	4.17
instance n=100 90.alb	1	1	Solution	30.12	21	20.00	4.76
instance n=100 91.alb	1	1	Solution	30.12	25	25.00	0.00
instance n=100 92.alb	1	1	Solution	30.13	24	24.00	0.00
instance n=100 93.alb	1	1	Solution	30.14	28	27.00	3.57
instance n=100 94.alb	1	1	Solution	30.11	23	22.00	4.35
instance n=100 95.alb	1	1	Solution	30.16	21	21.00	0.00
instance n=100 96.alb	1	1	Solution	30.16	22	21.00	4.55
instance n=100 97.alb	1	1	Solution	30.14	22	22.00	0.00
instance n=100 98.alb	1	1	Solution	30.11	22	22.00	0.00
instance n=100 99.alb	1	1	Solution	30.12	22	22.00	0.00
instance n=20 1.alb	1	1	Optimal	30.02	3	3.00	0.00
instance n=20 10.alb	1	1	Optimal	0.16	3	3.00	0.00
instance n=20 100.alb	1	1	Solution	30.05	11	10.00	9.09
instance n=20 101.alb	1	1	Solution	30.04	13	11.00	15.38
instance n=20 102.alb	1	1	Solution	30.01	13	11.00	15.38
instance n=20 103.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 104.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 105.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=20 106.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 107.alb	1	1	Solution	30.02	14	12.00	14.29
instance n=20 108.alb	1	1	Solution	30.02	15	12.00	20.00
instance n=20 109.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=20 11.alb	1	1	Optimal	1.05	3	3.00	0.00
instance n=20 110.alb	1	1	Optimal	16.53	11	11.00	0.00
instance n=20 111.alb	1	1	Solution	30.03	13	11.00	15.38
instance n=20 112.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 113.alb	1	1	Optimal	30.01	12	12.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 114.alb	1	1	Optimal	30.02	13	13.00	0.00
instance n=20 115.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 116.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 117.alb	1	1	Optimal	0.69	5	5.00	0.00
instance n=20 118.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 119.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 12.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 120.alb	1	1	Optimal	1.63	6	6.00	0.00
instance n=20 121.alb	1	1	Optimal	3.80	5	5.00	0.00
instance n=20 122.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 123.alb	1	1	Optimal	2.14	5	5.00	0.00
instance n=20 124.alb	1	1	Optimal	0.76	5	5.00	0.00
instance n=20 125.alb	1	1	Optimal	3.98	5	5.00	0.00
instance n=20 126.alb	1	1	Optimal	0.13	5	5.00	0.00
instance n=20 127.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 128.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 129.alb	1	1	Optimal	30.00	5	5.00	0.00
instance n=20 13.alb	1	1	Optimal	30.02	3	3.00	0.00
instance n=20 130.alb	1	1	Optimal	3.18	6	6.00	0.00
instance n=20 131.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=20 132.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 133.alb	1	1	Optimal	3.71	5	5.00	0.00
instance n=20 134.alb	1	1	Optimal	30.02	6	6.00	0.00
instance n=20 135.alb	1	1	Optimal	4.34	6	6.00	0.00
instance n=20 136.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 137.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 138.alb	1	1	Optimal	1.25	5	5.00	0.00
instance n=20 139.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 14.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 140.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 141.alb	1	1	Optimal	2.41	3	3.00	0.00
instance n=20 142.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 143.alb	1	1	Optimal	0.17	3	3.00	0.00
instance n=20 144.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 145.alb	1	1	Optimal	7.90	3	3.00	0.00
instance n=20 146.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 147.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 148.alb	1	1	Optimal	6.23	3	3.00	0.00
instance n=20 149.alb	1	1	Optimal	9.56	3	3.00	0.00
instance n=20 15.alb	1	1	Optimal	0.19	3	3.00	0.00
instance n=20 150.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 151.alb	1	1	Optimal	5.10	3	3.00	0.00
instance n=20 152.alb	1	1	Optimal	0.62	3	3.00	0.00
instance n=20 153.alb	1	1	Optimal	7.63	3	3.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 154.alb	1	1	Optimal	1.00	3	3.00	0.00
instance n=20 155.alb	1	1	Optimal	3.51	3	3.00	0.00
instance n=20 156.alb	1	1	Optimal	30.02	3	3.00	0.00
instance n=20 157.alb	1	1	Optimal	1.49	3	3.00	0.00
instance n=20 158.alb	1	1	Optimal	0.91	3	3.00	0.00
instance n=20 159.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 16.alb	1	1	Solution	30.03	12	11.00	8.33
instance n=20 160.alb	1	1	Optimal	15.24	3	3.00	0.00
instance n=20 161.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 162.alb	1	1	Optimal	6.01	3	3.00	0.00
instance n=20 163.alb	1	1	Optimal	0.68	3	3.00	0.00
instance n=20 164.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 165.alb	1	1	Optimal	3.52	3	3.00	0.00
instance n=20 166.alb	1	1	Solution	30.04	12	11.00	8.33
instance n=20 167.alb	1	1	Solution	30.04	11	10.00	9.09
instance n=20 168.alb	1	1	Solution	30.05	10	10.00	0.00
instance n=20 169.alb	1	1	Solution	30.04	11	10.00	9.09
instance n=20 17.alb	1	1	Solution	30.02	10	10.00	0.00
instance n=20 170.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=20 171.alb	1	1	Solution	30.03	13	11.00	15.38
instance n=20 172.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=20 173.alb	1	1	Solution	30.06	11	11.00	0.00
instance n=20 174.alb	1	1	Solution	30.04	12	11.00	8.33
instance n=20 175.alb	1	1	Optimal	30.02	10	10.00	0.00
instance n=20 176.alb	1	1	Solution	30.05	11	10.00	9.09
instance n=20 177.alb	1	1	Solution	30.03	10	9.00	10.00
instance n=20 178.alb	1	1	Solution	30.03	11	10.00	9.09
instance n=20 179.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=20 18.alb	1	1	Solution	30.03	11	10.00	9.09
instance n=20 180.alb	1	1	Solution	30.04	13	11.00	15.38
instance n=20 181.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 182.alb	1	1	Solution	30.03	11	10.00	9.09
instance n=20 183.alb	1	1	Solution	30.03	13	10.00	23.08
instance n=20 184.alb	1	1	Solution	30.03	12	11.00	8.33
instance n=20 185.alb	1	1	Solution	30.03	15	12.00	20.00
instance n=20 186.alb	1	1	Solution	30.03	14	12.00	14.29
instance n=20 187.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 188.alb	1	1	Solution	30.03	11	10.00	9.09
instance n=20 189.alb	1	1	Solution	30.02	13	11.00	15.38
instance n=20 19.alb	1	1	Solution	30.03	14	12.00	14.29
instance n=20 190.alb	1	1	Solution	30.02	15	12.00	20.00
instance n=20 191.alb	1	1	Optimal	4.15	4	4.00	0.00
instance n=20 192.alb	1	1	Optimal	9.21	5	5.00	0.00
instance n=20 193.alb	1	1	Optimal	30.01	5	5.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 194.alb	1	1	Optimal	3.67	6	6.00	0.00
instance n=20 195.alb	1	1	Optimal	5.01	6	6.00	0.00
instance n=20 196.alb	1	1	Optimal	7.78	5	5.00	0.00
instance n=20 197.alb	1	1	Optimal	24.50	4	4.00	0.00
instance n=20 198.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 199.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 2.alb	1	1	Optimal	30.02	3	3.00	0.00
instance n=20 20.alb	1	1	Solution	30.04	11	10.00	9.09
instance n=20 200.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 201.alb	1	1	Optimal	30.00	6	6.00	0.00
instance n=20 202.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 203.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 204.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 205.alb	1	1	Optimal	5.97	6	6.00	0.00
instance n=20 206.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 207.alb	1	1	Optimal	30.02	6	6.00	0.00
instance n=20 208.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 209.alb	1	1	Optimal	4.12	4	4.00	0.00
instance n=20 21.alb	1	1	Solution	30.03	14	12.00	14.29
instance n=20 210.alb	1	1	Optimal	28.35	5	5.00	0.00
instance n=20 211.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 212.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 213.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 214.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 215.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 216.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 217.alb	1	1	Optimal	0.16	4	4.00	0.00
instance n=20 218.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 219.alb	1	1	Optimal	5.35	3	3.00	0.00
instance n=20 22.alb	1	1	Solution	30.02	12	11.00	8.33
instance n=20 220.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 221.alb	1	1	Optimal	0.08	3	3.00	0.00
instance n=20 222.alb	1	1	Optimal	18.79	3	3.00	0.00
instance n=20 223.alb	1	1	Optimal	3.44	3	3.00	0.00
instance n=20 224.alb	1	1	Optimal	0.50	3	3.00	0.00
instance n=20 225.alb	1	1	Optimal	22.49	3	3.00	0.00
instance n=20 226.alb	1	1	Optimal	1.16	3	3.00	0.00
instance n=20 227.alb	1	1	Optimal	2.86	3	3.00	0.00
instance n=20 228.alb	1	1	Optimal	0.14	2	2.00	0.00
instance n=20 229.alb	1	1	Optimal	1.90	3	3.00	0.00
instance n=20 23.alb	1	1	Solution	30.04	13	11.00	15.38
instance n=20 230.alb	1	1	Optimal	3.11	3	3.00	0.00
instance n=20 231.alb	1	1	Optimal	6.88	3	3.00	0.00
instance n=20 232.alb	1	1	Optimal	1.18	3	3.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 233.alb	1	1	Optimal	2.39	3	3.00	0.00
instance n=20 234.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 235.alb	1	1	Optimal	15.52	3	3.00	0.00
instance n=20 236.alb	1	1	Optimal	0.16	3	3.00	0.00
instance n=20 237.alb	1	1	Optimal	0.19	3	3.00	0.00
instance n=20 238.alb	1	1	Optimal	16.35	3	3.00	0.00
instance n=20 239.alb	1	1	Optimal	8.76	3	3.00	0.00
instance n=20 24.alb	1	1	Solution	30.02	11	11.00	0.00
instance n=20 240.alb	1	1	Optimal	30.02	3	3.00	0.00
instance n=20 241.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=20 242.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 243.alb	1	1	Optimal	30.02	10	10.00	0.00
instance n=20 244.alb	1	1	Optimal	15.29	11	11.00	0.00
instance n=20 245.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=20 246.alb	1	1	Solution	30.04	13	12.00	7.69
instance n=20 247.alb	1	1	Optimal	30.00	11	11.00	0.00
instance n=20 248.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 249.alb	1	1	Solution	30.04	13	11.00	15.38
instance n=20 25.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 250.alb	1	1	Optimal	30.02	10	10.00	0.00
instance n=20 251.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 252.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 253.alb	1	1	Solution	30.03	13	11.00	15.38
instance n=20 254.alb	1	1	Optimal	30.00	12	12.00	0.00
instance n=20 255.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=20 256.alb	1	1	Optimal	30.02	14	14.00	0.00
instance n=20 257.alb	1	1	Optimal	30.02	10	10.00	0.00
instance n=20 258.alb	1	1	Optimal	30.02	13	13.00	0.00
instance n=20 259.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=20 26.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 260.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=20 261.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 262.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 263.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 264.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 265.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 266.alb	1	1	Optimal	0.10	5	5.00	0.00
instance n=20 267.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 268.alb	1	1	Optimal	4.30	6	6.00	0.00
instance n=20 269.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=20 27.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=20 270.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=20 271.alb	1	1	Optimal	0.08	6	6.00	0.00
instance n=20 272.alb	1	1	Optimal	0.12	5	5.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 273.alb	1	1	Optimal	0.10	5	5.00	0.00
instance n=20 274.alb	1	1	Optimal	30.02	6	6.00	0.00
instance n=20 275.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 276.alb	1	1	Optimal	20.89	4	4.00	0.00
instance n=20 277.alb	1	1	Optimal	3.50	4	4.00	0.00
instance n=20 278.alb	1	1	Optimal	0.12	6	6.00	0.00
instance n=20 279.alb	1	1	Optimal	0.13	6	6.00	0.00
instance n=20 28.alb	1	1	Optimal	30.03	12	12.00	0.00
instance n=20 280.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 281.alb	1	1	Optimal	0.36	4	4.00	0.00
instance n=20 282.alb	1	1	Optimal	0.21	4	4.00	0.00
instance n=20 283.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 284.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 285.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 286.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 287.alb	1	1	Optimal	1.58	5	5.00	0.00
instance n=20 288.alb	1	1	Optimal	25.58	6	6.00	0.00
instance n=20 289.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 29.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 290.alb	1	1	Optimal	4.64	5	5.00	0.00
instance n=20 291.alb	1	1	Optimal	0.57	3	3.00	0.00
instance n=20 292.alb	1	1	Optimal	1.03	3	3.00	0.00
instance n=20 293.alb	1	1	Optimal	0.51	3	3.00	0.00
instance n=20 294.alb	1	1	Optimal	0.06	3	3.00	0.00
instance n=20 295.alb	1	1	Optimal	2.39	3	3.00	0.00
instance n=20 296.alb	1	1	Optimal	2.28	3	3.00	0.00
instance n=20 297.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 298.alb	1	1	Optimal	0.21	3	3.00	0.00
instance n=20 299.alb	1	1	Optimal	0.26	3	3.00	0.00
instance n=20 3.alb	1	1	Optimal	0.94	3	3.00	0.00
instance n=20 30.alb	1	1	Solution	30.05	16	14.00	12.50
instance n=20 300.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 301.alb	1	1	Optimal	0.39	3	3.00	0.00
instance n=20 302.alb	1	1	Optimal	2.00	3	3.00	0.00
instance n=20 303.alb	1	1	Optimal	0.46	3	3.00	0.00
instance n=20 304.alb	1	1	Optimal	0.57	3	3.00	0.00
instance n=20 305.alb	1	1	Optimal	0.56	3	3.00	0.00
instance n=20 306.alb	1	1	Optimal	2.57	3	3.00	0.00
instance n=20 307.alb	1	1	Optimal	0.21	3	3.00	0.00
instance n=20 308.alb	1	1	Optimal	0.26	3	3.00	0.00
instance n=20 309.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 31.alb	1	1	Optimal	30.03	12	12.00	0.00
instance n=20 310.alb	1	1	Optimal	0.54	3	3.00	0.00
instance n=20 311.alb	1	1	Optimal	0.17	3	3.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 312.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 313.alb	1	1	Optimal	25.36	3	3.00	0.00
instance n=20 314.alb	1	1	Optimal	2.52	3	3.00	0.00
instance n=20 315.alb	1	1	Optimal	4.18	3	3.00	0.00
instance n=20 316.alb	1	1	Solution	30.10	10	10.00	0.00
instance n=20 317.alb	1	1	Solution	30.05	10	10.00	0.00
instance n=20 318.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 319.alb	1	1	Solution	30.04	14	13.00	7.14
instance n=20 32.alb	1	1	Solution	30.07	13	12.00	7.69
instance n=20 320.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 321.alb	1	1	Solution	30.04	14	11.00	21.43
instance n=20 322.alb	1	1	Solution	30.05	12	11.00	8.33
instance n=20 323.alb	1	1	Solution	30.03	13	12.00	7.69
instance n=20 324.alb	1	1	Optimal	30.02	9	9.00	0.00
instance n=20 325.alb	1	1	Solution	30.08	14	12.00	14.29
instance n=20 326.alb	1	1	Solution	30.03	14	12.00	14.29
instance n=20 327.alb	1	1	Solution	30.07	13	11.00	15.38
instance n=20 328.alb	1	1	Solution	30.05	13	12.00	7.69
instance n=20 329.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 33.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 330.alb	1	1	Solution	30.05	12	11.00	8.33
instance n=20 331.alb	1	1	Solution	30.05	13	12.00	7.69
instance n=20 332.alb	1	1	Solution	30.06	13	12.00	7.69
instance n=20 333.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 334.alb	1	1	Optimal	30.02	10	10.00	0.00
instance n=20 335.alb	1	1	Solution	30.04	14	11.00	21.43
instance n=20 336.alb	1	1	Optimal	30.03	11	11.00	0.00
instance n=20 337.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 338.alb	1	1	Solution	30.04	14	13.00	7.14
instance n=20 339.alb	1	1	Solution	30.08	13	11.00	15.38
instance n=20 34.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 340.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 341.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 342.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 343.alb	1	1	Optimal	8.23	6	6.00	0.00
instance n=20 344.alb	1	1	Optimal	30.02	6	6.00	0.00
instance n=20 345.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 346.alb	1	1	Optimal	5.24	5	5.00	0.00
instance n=20 347.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 348.alb	1	1	Optimal	7.73	5	5.00	0.00
instance n=20 349.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 35.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=20 350.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 351.alb	1	1	Optimal	0.12	5	5.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 352.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 353.alb	1	1	Optimal	30.03	6	6.00	0.00
instance n=20 354.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 355.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 356.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 357.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 358.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 359.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 36.alb	1	1	Optimal	30.02	13	13.00	0.00
instance n=20 360.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 361.alb	1	1	Optimal	30.03	5	5.00	0.00
instance n=20 362.alb	1	1	Optimal	16.15	5	5.00	0.00
instance n=20 363.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=20 364.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 365.alb	1	1	Optimal	9.48	5	5.00	0.00
instance n=20 366.alb	1	1	Optimal	4.00	3	3.00	0.00
instance n=20 367.alb	1	1	Optimal	16.12	3	3.00	0.00
instance n=20 368.alb	1	1	Optimal	5.45	3	3.00	0.00
instance n=20 369.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 37.alb	1	1	Solution	30.07	12	12.00	0.00
instance n=20 370.alb	1	1	Optimal	0.08	3	3.00	0.00
instance n=20 371.alb	1	1	Optimal	12.65	3	3.00	0.00
instance n=20 372.alb	1	1	Optimal	0.20	3	3.00	0.00
instance n=20 373.alb	1	1	Optimal	0.18	3	3.00	0.00
instance n=20 374.alb	1	1	Optimal	1.01	3	3.00	0.00
instance n=20 375.alb	1	1	Optimal	0.26	3	3.00	0.00
instance n=20 376.alb	1	1	Optimal	2.23	3	3.00	0.00
instance n=20 377.alb	1	1	Optimal	0.29	3	3.00	0.00
instance n=20 378.alb	1	1	Optimal	0.07	3	3.00	0.00
instance n=20 379.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 38.alb	1	1	Optimal	30.03	12	12.00	0.00
instance n=20 380.alb	1	1	Optimal	4.86	3	3.00	0.00
instance n=20 381.alb	1	1	Optimal	11.59	3	3.00	0.00
instance n=20 382.alb	1	1	Optimal	2.89	4	4.00	0.00
instance n=20 383.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 384.alb	1	1	Optimal	15.04	3	3.00	0.00
instance n=20 385.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 386.alb	1	1	Optimal	30.02	3	3.00	0.00
instance n=20 387.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 388.alb	1	1	Optimal	5.20	3	3.00	0.00
instance n=20 389.alb	1	1	Optimal	6.92	3	3.00	0.00
instance n=20 39.alb	1	1	Solution	30.03	13	13.00	0.00
instance n=20 390.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 391.alb	1	1	Optimal	30.03	11	11.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 392.alb	1	1	Optimal	30.01	14	14.00	0.00
instance n=20 393.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 394.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 395.alb	1	1	Optimal	30.03	12	12.00	0.00
instance n=20 396.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=20 397.alb	1	1	Optimal	25.57	10	10.00	0.00
instance n=20 398.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 399.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=20 4.alb	1	1	Optimal	0.37	3	3.00	0.00
instance n=20 40.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=20 400.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=20 401.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 402.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=20 403.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 404.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 405.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 406.alb	1	1	Optimal	30.02	14	14.00	0.00
instance n=20 407.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 408.alb	1	1	Optimal	30.01	14	14.00	0.00
instance n=20 409.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 41.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 410.alb	1	1	Optimal	9.48	11	11.00	0.00
instance n=20 411.alb	1	1	Optimal	30.01	15	15.00	0.00
instance n=20 412.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 413.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 414.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=20 415.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 416.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 417.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 418.alb	1	1	Optimal	0.26	6	6.00	0.00
instance n=20 419.alb	1	1	Optimal	30.02	4	4.00	0.00
instance n=20 42.alb	1	1	Optimal	0.96	5	5.00	0.00
instance n=20 420.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 421.alb	1	1	Optimal	30.02	6	6.00	0.00
instance n=20 422.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 423.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 424.alb	1	1	Optimal	0.21	5	5.00	0.00
instance n=20 425.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 426.alb	1	1	Optimal	0.76	5	5.00	0.00
instance n=20 427.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=20 428.alb	1	1	Optimal	0.10	5	5.00	0.00
instance n=20 429.alb	1	1	Optimal	2.78	4	4.00	0.00
instance n=20 43.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 430.alb	1	1	Optimal	30.01	5	5.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 431.alb	1	1	Optimal	0.20	6	6.00	0.00
instance n=20 432.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 433.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 434.alb	1	1	Optimal	26.33	5	5.00	0.00
instance n=20 435.alb	1	1	Optimal	0.46	7	7.00	0.00
instance n=20 436.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 437.alb	1	1	Optimal	0.43	5	5.00	0.00
instance n=20 438.alb	1	1	Optimal	30.03	6	6.00	0.00
instance n=20 439.alb	1	1	Optimal	23.64	5	5.00	0.00
instance n=20 44.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 440.alb	1	1	Optimal	0.09	5	5.00	0.00
instance n=20 441.alb	1	1	Optimal	0.09	3	3.00	0.00
instance n=20 442.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 443.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 444.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 445.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 446.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 447.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 448.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 449.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 45.alb	1	1	Optimal	2.06	6	6.00	0.00
instance n=20 450.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 451.alb	1	1	Optimal	0.45	3	3.00	0.00
instance n=20 452.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 453.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 454.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 455.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 456.alb	1	1	Optimal	0.11	4	4.00	0.00
instance n=20 457.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 458.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 459.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 46.alb	1	1	Optimal	15.03	4	4.00	0.00
instance n=20 460.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 461.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 462.alb	1	1	Optimal	0.11	3	3.00	0.00
instance n=20 463.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 464.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 465.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 466.alb	1	1	Optimal	0.12	13	13.00	0.00
instance n=20 467.alb	1	1	Optimal	30.01	14	14.00	0.00
instance n=20 468.alb	1	1	Optimal	5.14	13	13.00	0.00
instance n=20 469.alb	1	1	Optimal	30.02	14	14.00	0.00
instance n=20 47.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 470.alb	1	1	Optimal	30.01	12	12.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 471.alb	1	1	Optimal	14.12	12	12.00	0.00
instance n=20 472.alb	1	1	Optimal	30.02	13	13.00	0.00
instance n=20 473.alb	1	1	Optimal	0.11	10	10.00	0.00
instance n=20 474.alb	1	1	Optimal	30.01	14	14.00	0.00
instance n=20 475.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 476.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 477.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 478.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 479.alb	1	1	Optimal	30.03	13	13.00	0.00
instance n=20 48.alb	1	1	Optimal	8.19	5	5.00	0.00
instance n=20 480.alb	1	1	Optimal	30.02	13	13.00	0.00
instance n=20 481.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=20 482.alb	1	1	Optimal	30.03	13	13.00	0.00
instance n=20 483.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 484.alb	1	1	Optimal	30.02	13	13.00	0.00
instance n=20 485.alb	1	1	Optimal	30.02	15	15.00	0.00
instance n=20 486.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 487.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 488.alb	1	1	Optimal	19.07	15	15.00	0.00
instance n=20 489.alb	1	1	Optimal	5.26	12	12.00	0.00
instance n=20 49.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 490.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 491.alb	1	1	Optimal	0.09	6	6.00	0.00
instance n=20 492.alb	1	1	Optimal	0.09	5	5.00	0.00
instance n=20 493.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 494.alb	1	1	Optimal	0.09	6	6.00	0.00
instance n=20 495.alb	1	1	Optimal	0.11	6	6.00	0.00
instance n=20 496.alb	1	1	Optimal	0.09	5	5.00	0.00
instance n=20 497.alb	1	1	Optimal	0.09	6	6.00	0.00
instance n=20 498.alb	1	1	Optimal	0.11	6	6.00	0.00
instance n=20 499.alb	1	1	Optimal	6.84	5	5.00	0.00
instance n=20 5.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 50.alb	1	1	Optimal	30.01	4	4.00	0.00
instance n=20 500.alb	1	1	Optimal	0.09	8	8.00	0.00
instance n=20 501.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 502.alb	1	1	Optimal	0.11	4	4.00	0.00
instance n=20 503.alb	1	1	Optimal	0.45	6	6.00	0.00
instance n=20 504.alb	1	1	Optimal	0.17	6	6.00	0.00
instance n=20 505.alb	1	1	Optimal	0.09	6	6.00	0.00
instance n=20 506.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 507.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 508.alb	1	1	Optimal	0.09	5	5.00	0.00
instance n=20 509.alb	1	1	Optimal	0.10	4	4.00	0.00
instance n=20 51.alb	1	1	Optimal	26.52	4	4.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 510.alb	1	1	Optimal	0.09	5	5.00	0.00
instance n=20 511.alb	1	1	Optimal	0.09	5	5.00	0.00
instance n=20 512.alb	1	1	Optimal	0.12	5	5.00	0.00
instance n=20 513.alb	1	1	Optimal	0.11	5	5.00	0.00
instance n=20 514.alb	1	1	Optimal	0.08	5	5.00	0.00
instance n=20 515.alb	1	1	Optimal	0.09	6	6.00	0.00
instance n=20 516.alb	1	1	Optimal	1.15	3	3.00	0.00
instance n=20 517.alb	1	1	Optimal	25.97	3	3.00	0.00
instance n=20 518.alb	1	1	Optimal	1.31	3	3.00	0.00
instance n=20 519.alb	1	1	Optimal	19.32	3	3.00	0.00
instance n=20 52.alb	1	1	Optimal	2.79	4	4.00	0.00
instance n=20 520.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 521.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 522.alb	1	1	Optimal	2.17	3	3.00	0.00
instance n=20 523.alb	1	1	Optimal	5.22	3	3.00	0.00
instance n=20 524.alb	1	1	Optimal	6.79	3	3.00	0.00
instance n=20 525.alb	1	1	Optimal	1.43	3	3.00	0.00
instance n=20 53.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 54.alb	1	1	Optimal	11.00	5	5.00	0.00
instance n=20 55.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 56.alb	1	1	Optimal	2.18	4	4.00	0.00
instance n=20 57.alb	1	1	Optimal	1.07	4	4.00	0.00
instance n=20 58.alb	1	1	Optimal	0.78	5	5.00	0.00
instance n=20 59.alb	1	1	Optimal	7.14	4	4.00	0.00
instance n=20 6.alb	1	1	Optimal	2.82	3	3.00	0.00
instance n=20 60.alb	1	1	Optimal	30.03	6	6.00	0.00
instance n=20 61.alb	1	1	Optimal	12.95	7	7.00	0.00
instance n=20 62.alb	1	1	Optimal	0.65	5	5.00	0.00
instance n=20 63.alb	1	1	Optimal	30.02	5	5.00	0.00
instance n=20 64.alb	1	1	Optimal	7.17	5	5.00	0.00
instance n=20 65.alb	1	1	Optimal	30.01	5	5.00	0.00
instance n=20 66.alb	1	1	Optimal	0.70	3	3.00	0.00
instance n=20 67.alb	1	1	Optimal	1.68	3	3.00	0.00
instance n=20 68.alb	1	1	Optimal	0.81	3	3.00	0.00
instance n=20 69.alb	1	1	Optimal	0.07	2	2.00	0.00
instance n=20 7.alb	1	1	Optimal	30.02	3	3.00	0.00
instance n=20 70.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 71.alb	1	1	Optimal	0.42	3	3.00	0.00
instance n=20 72.alb	1	1	Optimal	19.85	3	3.00	0.00
instance n=20 73.alb	1	1	Optimal	7.84	2	2.00	0.00
instance n=20 74.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 75.alb	1	1	Optimal	0.32	3	3.00	0.00
instance n=20 76.alb	1	1	Optimal	8.72	3	3.00	0.00
instance n=20 77.alb	1	1	Optimal	4.75	3	3.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=20 78.alb	1	1	Optimal	0.23	3	3.00	0.00
instance n=20 79.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 8.alb	1	1	Optimal	2.28	3	3.00	0.00
instance n=20 80.alb	1	1	Optimal	3.47	3	3.00	0.00
instance n=20 81.alb	1	1	Optimal	0.90	3	3.00	0.00
instance n=20 82.alb	1	1	Optimal	11.55	4	4.00	0.00
instance n=20 83.alb	1	1	Optimal	0.10	3	3.00	0.00
instance n=20 84.alb	1	1	Optimal	0.12	3	3.00	0.00
instance n=20 85.alb	1	1	Optimal	30.02	3	3.00	0.00
instance n=20 86.alb	1	1	Optimal	20.07	3	3.00	0.00
instance n=20 87.alb	1	1	Optimal	8.75	3	3.00	0.00
instance n=20 88.alb	1	1	Optimal	2.34	3	3.00	0.00
instance n=20 89.alb	1	1	Optimal	0.26	3	3.00	0.00
instance n=20 9.alb	1	1	Optimal	0.76	3	3.00	0.00
instance n=20 90.alb	1	1	Optimal	30.01	3	3.00	0.00
instance n=20 91.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=20 92.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=20 93.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=20 94.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 95.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=20 96.alb	1	1	Optimal	30.01	10	10.00	0.00
instance n=20 97.alb	1	1	Optimal	30.03	15	15.00	0.00
instance n=20 98.alb	1	1	Optimal	30.02	13	13.00	0.00
instance n=20 99.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=50 1.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 10.alb	1	1	Optimal	4.56	7	7.00	0.00
instance n=50 100.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 101.alb	1	1	Solution	30.05	30	26.00	13.33
instance n=50 102.alb	1	1	Solution	30.07	33	27.00	18.18
instance n=50 103.alb	1	1	Solution	30.06	29	25.00	13.79
instance n=50 104.alb	1	1	Solution	30.05	28	25.00	10.71
instance n=50 105.alb	1	1	Solution	30.04	24	23.00	4.17
instance n=50 106.alb	1	1	Solution	30.05	28	26.00	7.14
instance n=50 107.alb	1	1	Solution	30.03	28	26.00	7.14
instance n=50 108.alb	1	1	Solution	30.05	31	26.00	16.13
instance n=50 109.alb	1	1	Solution	30.02	30	25.00	16.67
instance n=50 11.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 110.alb	1	1	Solution	30.03	26	25.00	3.85
instance n=50 111.alb	1	1	Solution	30.04	28	26.00	7.14
instance n=50 112.alb	1	1	Solution	30.05	27	25.00	7.41
instance n=50 113.alb	1	1	Solution	30.04	28	26.00	7.14
instance n=50 114.alb	1	1	Solution	30.05	28	25.00	10.71
instance n=50 115.alb	1	1	Solution	30.06	29	25.00	13.79
instance n=50 116.alb	1	1	Solution	30.04	32	27.00	15.63

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 117.alb	1	1	Solution	30.06	27	25.00	7.41
instance n=50 118.alb	1	1	Solution	30.05	29	26.00	10.34
instance n=50 119.alb	1	1	Solution	30.03	25	24.00	4.00
instance n=50 12.alb	1	1	Optimal	1.84	6	6.00	0.00
instance n=50 120.alb	1	1	Solution	30.03	28	26.00	7.14
instance n=50 121.alb	1	1	Solution	30.05	32	27.00	15.63
instance n=50 122.alb	1	1	Solution	30.03	30	26.00	13.33
instance n=50 123.alb	1	1	Solution	30.04	32	26.00	18.75
instance n=50 124.alb	1	1	Solution	30.02	30	26.00	13.33
instance n=50 125.alb	1	1	Solution	30.05	33	26.00	21.21
instance n=50 126.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=50 127.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=50 128.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 129.alb	1	1	Solution	30.03	13	13.00	0.00
instance n=50 13.alb	1	1	Optimal	15.16	6	6.00	0.00
instance n=50 130.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=50 131.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 132.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 133.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 134.alb	1	1	Solution	30.04	14	14.00	0.00
instance n=50 135.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=50 136.alb	1	1	Solution	30.02	11	11.00	0.00
instance n=50 137.alb	1	1	Solution	30.06	11	11.00	0.00
instance n=50 138.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 139.alb	1	1	Solution	30.06	12	11.00	8.33
instance n=50 14.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 140.alb	1	1	Solution	30.06	12	12.00	0.00
instance n=50 141.alb	1	1	Solution	30.03	13	13.00	0.00
instance n=50 142.alb	1	1	Solution	30.02	11	11.00	0.00
instance n=50 143.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 144.alb	1	1	Solution	30.07	13	13.00	0.00
instance n=50 145.alb	1	1	Solution	30.03	10	10.00	0.00
instance n=50 146.alb	1	1	Solution	30.07	13	13.00	0.00
instance n=50 147.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=50 148.alb	1	1	Solution	30.02	10	10.00	0.00
instance n=50 149.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 15.alb	1	1	Solution	30.10	8	8.00	0.00
instance n=50 150.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=50 151.alb	1	1	Solution	30.06	7	7.00	0.00
instance n=50 152.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 153.alb	1	1	Solution	30.06	7	7.00	0.00
instance n=50 154.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 155.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 156.alb	1	1	Solution	30.05	7	7.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 157.alb	1	1	Optimal	30.01	8	8.00	0.00
instance n=50 158.alb	1	1	Solution	30.08	7	7.00	0.00
instance n=50 159.alb	1	1	Optimal	12.31	7	7.00	0.00
instance n=50 16.alb	1	1	Solution	30.03	8	8.00	0.00
instance n=50 160.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 161.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 162.alb	1	1	Solution	30.06	8	8.00	0.00
instance n=50 163.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 164.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 165.alb	1	1	Solution	30.07	8	8.00	0.00
instance n=50 166.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 167.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 168.alb	1	1	Solution	30.06	8	8.00	0.00
instance n=50 169.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 17.alb	1	1	Optimal	28.48	7	7.00	0.00
instance n=50 170.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 171.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 172.alb	1	1	Optimal	22.60	7	7.00	0.00
instance n=50 173.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 174.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 175.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 176.alb	1	1	Solution	30.04	27	25.00	7.41
instance n=50 177.alb	1	1	Solution	30.05	28	26.00	7.14
instance n=50 178.alb	1	1	Solution	30.05	28	25.00	10.71
instance n=50 179.alb	1	1	Solution	30.05	27	25.00	7.41
instance n=50 18.alb	1	1	Solution	30.06	7	7.00	0.00
instance n=50 180.alb	1	1	Solution	30.04	26	25.00	3.85
instance n=50 181.alb	1	1	Solution	30.03	30	26.00	13.33
instance n=50 182.alb	1	1	Solution	30.05	27	25.00	7.41
instance n=50 183.alb	1	1	Solution	30.07	29	26.00	10.34
instance n=50 184.alb	1	1	Solution	30.05	38	28.00	26.32
instance n=50 185.alb	1	1	Solution	30.03	27	25.00	7.41
instance n=50 186.alb	1	1	Solution	30.05	27	25.00	7.41
instance n=50 187.alb	1	1	Solution	30.05	26	25.00	3.85
instance n=50 188.alb	1	1	Solution	30.04	25	24.00	4.00
instance n=50 189.alb	1	1	Solution	30.04	26	25.00	3.85
instance n=50 19.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 190.alb	1	1	Solution	30.05	30	26.00	13.33
instance n=50 191.alb	1	1	Solution	30.04	28	26.00	7.14
instance n=50 192.alb	1	1	Solution	30.06	28	26.00	7.14
instance n=50 193.alb	1	1	Solution	30.06	29	26.00	10.34
instance n=50 194.alb	1	1	Solution	30.06	28	26.00	7.14
instance n=50 195.alb	1	1	Solution	30.03	29	26.00	10.34
instance n=50 196.alb	1	1	Solution	30.06	28	26.00	7.14

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 197.alb	1	1	Solution	30.06	29	26.00	10.34
instance n=50 198.alb	1	1	Solution	30.04	28	25.00	10.71
instance n=50 199.alb	1	1	Solution	30.05	29	26.00	10.34
instance n=50 2.alb	1	1	Optimal	30.02	6	6.00	0.00
instance n=50 20.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 200.alb	1	1	Solution	30.05	25	24.00	4.00
instance n=50 201.alb	1	1	Solution	30.07	13	13.00	0.00
instance n=50 202.alb	1	1	Solution	30.05	9	9.00	0.00
instance n=50 203.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=50 204.alb	1	1	Solution	30.04	10	10.00	0.00
instance n=50 205.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=50 206.alb	1	1	Solution	30.06	12	11.00	8.33
instance n=50 207.alb	1	1	Solution	30.05	10	10.00	0.00
instance n=50 208.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=50 209.alb	1	1	Solution	30.05	11	11.00	0.00
instance n=50 21.alb	1	1	Optimal	17.79	6	6.00	0.00
instance n=50 210.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=50 211.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 212.alb	1	1	Solution	30.04	10	10.00	0.00
instance n=50 213.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=50 214.alb	1	1	Solution	30.06	11	11.00	0.00
instance n=50 215.alb	1	1	Solution	30.05	11	11.00	0.00
instance n=50 216.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 217.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=50 218.alb	1	1	Solution	30.06	12	12.00	0.00
instance n=50 219.alb	1	1	Solution	30.07	11	11.00	0.00
instance n=50 22.alb	1	1	Solution	30.06	7	7.00	0.00
instance n=50 220.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 221.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 222.alb	1	1	Solution	30.05	14	14.00	0.00
instance n=50 223.alb	1	1	Solution	30.09	11	11.00	0.00
instance n=50 224.alb	1	1	Solution	30.06	11	11.00	0.00
instance n=50 225.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 226.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 227.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=50 228.alb	1	1	Optimal	3.93	6	6.00	0.00
instance n=50 229.alb	1	1	Optimal	30.02	6	6.00	0.00
instance n=50 23.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 230.alb	1	1	Optimal	25.93	7	7.00	0.00
instance n=50 231.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 232.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 233.alb	1	1	Optimal	30.03	6	6.00	0.00
instance n=50 234.alb	1	1	Optimal	15.10	8	8.00	0.00
instance n=50 235.alb	1	1	Optimal	30.02	7	7.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 236.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 237.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 238.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 239.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 24.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 240.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 241.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 242.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 243.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 244.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 245.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 246.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 247.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 248.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 249.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 25.alb	1	1	Optimal	8.64	6	6.00	0.00
instance n=50 250.alb	1	1	Optimal	25.86	7	7.00	0.00
instance n=50 251.alb	1	1	Solution	30.05	27	25.00	7.41
instance n=50 252.alb	1	1	Solution	30.02	32	27.00	15.63
instance n=50 253.alb	1	1	Solution	30.03	29	26.00	10.34
instance n=50 254.alb	1	1	Solution	30.05	30	26.00	13.33
instance n=50 255.alb	1	1	Solution	30.05	30	26.00	13.33
instance n=50 256.alb	1	1	Solution	30.06	31	27.00	12.90
instance n=50 257.alb	1	1	Solution	30.08	33	28.00	15.15
instance n=50 258.alb	1	1	Solution	30.04	28	25.00	10.71
instance n=50 259.alb	1	1	Solution	30.06	31	26.00	16.13
instance n=50 26.alb	1	1	Solution	30.04	27	25.00	7.41
instance n=50 260.alb	1	1	Solution	30.03	29	26.00	10.34
instance n=50 261.alb	1	1	Solution	30.06	28	25.00	10.71
instance n=50 262.alb	1	1	Solution	30.04	31	26.00	16.13
instance n=50 263.alb	1	1	Solution	30.07	30	26.00	13.33
instance n=50 264.alb	1	1	Solution	30.02	28	25.00	10.71
instance n=50 265.alb	1	1	Solution	30.03	27	25.00	7.41
instance n=50 266.alb	1	1	Solution	30.04	29	26.00	10.34
instance n=50 267.alb	1	1	Solution	30.04	29	26.00	10.34
instance n=50 268.alb	1	1	Solution	30.05	29	26.00	10.34
instance n=50 269.alb	1	1	Solution	30.03	27	26.00	3.70
instance n=50 27.alb	1	1	Solution	30.05	30	27.00	10.00
instance n=50 270.alb	1	1	Solution	30.03	28	26.00	7.14
instance n=50 271.alb	1	1	Solution	30.05	32	26.00	18.75
instance n=50 272.alb	1	1	Solution	30.03	27	25.00	7.41
instance n=50 273.alb	1	1	Solution	30.03	28	25.00	10.71
instance n=50 274.alb	1	1	Solution	30.06	30	26.00	13.33
instance n=50 275.alb	1	1	Solution	30.04	28	26.00	7.14

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 276.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 277.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=50 278.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 279.alb	1	1	Solution	30.07	11	11.00	0.00
instance n=50 28.alb	1	1	Solution	30.05	28	26.00	7.14
instance n=50 280.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=50 281.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=50 282.alb	1	1	Solution	30.07	12	11.00	8.33
instance n=50 283.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 284.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=50 285.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=50 286.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=50 287.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 288.alb	1	1	Optimal	30.02	10	10.00	0.00
instance n=50 289.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=50 29.alb	1	1	Solution	30.05	29	25.00	13.79
instance n=50 290.alb	1	1	Solution	30.04	14	14.00	0.00
instance n=50 291.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 292.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=50 293.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 294.alb	1	1	Solution	30.03	13	13.00	0.00
instance n=50 295.alb	1	1	Solution	30.04	16	16.00	0.00
instance n=50 296.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=50 297.alb	1	1	Solution	30.03	13	13.00	0.00
instance n=50 298.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 299.alb	1	1	Solution	30.04	12	11.00	8.33
instance n=50 3.alb	1	1	Solution	30.06	8	8.00	0.00
instance n=50 30.alb	1	1	Solution	30.04	27	25.00	7.41
instance n=50 300.alb	1	1	Optimal	30.02	12	12.00	0.00
instance n=50 301.alb	1	1	Optimal	4.84	6	6.00	0.00
instance n=50 302.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 303.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 304.alb	1	1	Optimal	23.39	7	7.00	0.00
instance n=50 305.alb	1	1	Solution	30.07	8	8.00	0.00
instance n=50 306.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 307.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 308.alb	1	1	Optimal	30.03	8	8.00	0.00
instance n=50 309.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 31.alb	1	1	Solution	30.05	28	25.00	10.71
instance n=50 310.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 311.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 312.alb	1	1	Optimal	4.22	6	6.00	0.00
instance n=50 313.alb	1	1	Solution	30.06	8	8.00	0.00
instance n=50 314.alb	1	1	Optimal	14.83	7	7.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 315.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 316.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 317.alb	1	1	Optimal	11.95	6	6.00	0.00
instance n=50 318.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 319.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 32.alb	1	1	Solution	30.05	26	25.00	3.85
instance n=50 320.alb	1	1	Solution	30.06	8	8.00	0.00
instance n=50 321.alb	1	1	Optimal	7.66	6	6.00	0.00
instance n=50 322.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 323.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 324.alb	1	1	Solution	30.09	7	7.00	0.00
instance n=50 325.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 326.alb	1	1	Solution	30.05	33	27.00	18.18
instance n=50 327.alb	1	1	Solution	30.05	28	25.00	10.71
instance n=50 328.alb	1	1	Solution	30.04	32	27.00	15.63
instance n=50 329.alb	1	1	Solution	30.05	25	24.00	4.00
instance n=50 33.alb	1	1	Solution	30.04	25	24.00	4.00
instance n=50 330.alb	1	1	Solution	30.06	29	25.00	13.79
instance n=50 331.alb	1	1	Solution	30.04	29	26.00	10.34
instance n=50 332.alb	1	1	Solution	30.08	25	24.00	4.00
instance n=50 333.alb	1	1	Solution	30.03	28	25.00	10.71
instance n=50 334.alb	1	1	Solution	30.04	29	25.00	13.79
instance n=50 335.alb	1	1	Solution	30.10	27	26.00	3.70
instance n=50 336.alb	1	1	Solution	30.04	26	25.00	3.85
instance n=50 337.alb	1	1	Solution	30.06	26	25.00	3.85
instance n=50 338.alb	1	1	Solution	30.03	27	25.00	7.41
instance n=50 339.alb	1	1	Solution	30.05	27	26.00	3.70
instance n=50 34.alb	1	1	Solution	30.06	30	26.00	13.33
instance n=50 340.alb	1	1	Solution	30.04	28	25.00	10.71
instance n=50 341.alb	1	1	Solution	30.07	27	25.00	7.41
instance n=50 342.alb	1	1	Solution	30.07	28	26.00	7.14
instance n=50 343.alb	1	1	Solution	30.08	27	25.00	7.41
instance n=50 344.alb	1	1	Solution	30.07	30	26.00	13.33
instance n=50 345.alb	1	1	Solution	30.04	30	27.00	10.00
instance n=50 346.alb	1	1	Solution	30.05	27	25.00	7.41
instance n=50 347.alb	1	1	Solution	30.05	26	25.00	3.85
instance n=50 348.alb	1	1	Solution	30.04	30	25.00	16.67
instance n=50 349.alb	1	1	Solution	30.03	29	26.00	10.34
instance n=50 35.alb	1	1	Solution	30.07	33	27.00	18.18
instance n=50 350.alb	1	1	Solution	30.05	24	23.00	4.17
instance n=50 351.alb	1	1	Solution	30.06	12	12.00	0.00
instance n=50 352.alb	1	1	Solution	30.06	10	10.00	0.00
instance n=50 353.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=50 354.alb	1	1	Solution	30.05	14	13.00	7.14

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 355.alb	1	1	Solution	30.06	11	11.00	0.00
instance n=50 356.alb	1	1	Solution	30.05	15	15.00	0.00
instance n=50 357.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 358.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=50 359.alb	1	1	Solution	30.05	10	10.00	0.00
instance n=50 36.alb	1	1	Solution	30.06	31	26.00	16.13
instance n=50 360.alb	1	1	Solution	30.07	12	12.00	0.00
instance n=50 361.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 362.alb	1	1	Solution	30.04	10	10.00	0.00
instance n=50 363.alb	1	1	Solution	30.05	12	11.00	8.33
instance n=50 364.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=50 365.alb	1	1	Solution	30.07	11	11.00	0.00
instance n=50 366.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=50 367.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 368.alb	1	1	Solution	30.06	12	12.00	0.00
instance n=50 369.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 37.alb	1	1	Solution	30.08	32	27.00	15.63
instance n=50 370.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 371.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 372.alb	1	1	Solution	30.05	10	10.00	0.00
instance n=50 373.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 374.alb	1	1	Solution	30.07	11	11.00	0.00
instance n=50 375.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=50 376.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 377.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 378.alb	1	1	Solution	30.06	8	8.00	0.00
instance n=50 379.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 38.alb	1	1	Solution	30.05	31	27.00	12.90
instance n=50 380.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 381.alb	1	1	Optimal	30.01	8	8.00	0.00
instance n=50 382.alb	1	1	Solution	30.05	6	6.00	0.00
instance n=50 383.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 384.alb	1	1	Solution	30.03	8	8.00	0.00
instance n=50 385.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 386.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 387.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 388.alb	1	1	Optimal	27.09	7	7.00	0.00
instance n=50 389.alb	1	1	Optimal	30.01	8	8.00	0.00
instance n=50 39.alb	1	1	Solution	30.05	29	26.00	10.34
instance n=50 390.alb	1	1	Solution	30.06	7	7.00	0.00
instance n=50 391.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 392.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 393.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 394.alb	1	1	Solution	30.04	8	8.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 395.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 396.alb	1	1	Optimal	30.01	8	8.00	0.00
instance n=50 397.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 398.alb	1	1	Solution	30.06	6	6.00	0.00
instance n=50 399.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 4.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 40.alb	1	1	Solution	30.06	27	25.00	7.41
instance n=50 400.alb	1	1	Optimal	30.02	8	8.00	0.00
instance n=50 401.alb	1	1	Solution	30.04	28	25.00	10.71
instance n=50 402.alb	1	1	Solution	30.02	28	26.00	7.14
instance n=50 403.alb	1	1	Solution	30.06	34	28.00	17.65
instance n=50 404.alb	1	1	Solution	30.06	31	26.00	16.13
instance n=50 405.alb	1	1	Solution	30.04	27	26.00	3.70
instance n=50 406.alb	1	1	Solution	30.04	33	27.00	18.18
instance n=50 407.alb	1	1	Solution	30.06	29	26.00	10.34
instance n=50 408.alb	1	1	Solution	30.03	26	25.00	3.85
instance n=50 409.alb	1	1	Solution	30.05	33	27.00	18.18
instance n=50 41.alb	1	1	Solution	30.05	26	25.00	3.85
instance n=50 410.alb	1	1	Solution	30.04	29	26.00	10.34
instance n=50 411.alb	1	1	Solution	30.03	30	27.00	10.00
instance n=50 412.alb	1	1	Solution	30.04	26	25.00	3.85
instance n=50 413.alb	1	1	Solution	30.02	31	26.00	16.13
instance n=50 414.alb	1	1	Solution	30.03	27	25.00	7.41
instance n=50 415.alb	1	1	Solution	30.03	29	25.00	13.79
instance n=50 416.alb	1	1	Solution	30.06	27	25.00	7.41
instance n=50 417.alb	1	1	Solution	30.03	30	27.00	10.00
instance n=50 418.alb	1	1	Solution	30.05	28	25.00	10.71
instance n=50 419.alb	1	1	Solution	30.05	34	27.00	20.59
instance n=50 42.alb	1	1	Solution	30.03	24	23.00	4.17
instance n=50 420.alb	1	1	Solution	30.02	28	25.00	10.71
instance n=50 421.alb	1	1	Solution	30.03	35	28.00	20.00
instance n=50 422.alb	1	1	Solution	30.04	29	26.00	10.34
instance n=50 423.alb	1	1	Solution	30.03	29	26.00	10.34
instance n=50 424.alb	1	1	Solution	30.03	27	26.00	3.70
instance n=50 425.alb	1	1	Solution	30.05	35	28.00	20.00
instance n=50 426.alb	1	1	Solution	30.07	11	11.00	0.00
instance n=50 427.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 428.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=50 429.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 43.alb	1	1	Solution	30.04	26	25.00	3.85
instance n=50 430.alb	1	1	Solution	30.04	14	14.00	0.00
instance n=50 431.alb	1	1	Optimal	2.68	11	11.00	0.00
instance n=50 432.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 433.alb	1	1	Solution	30.03	12	12.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 434.alb	1	1	Solution	30.03	11	11.00	0.00
instance n=50 435.alb	1	1	Solution	30.05	11	11.00	0.00
instance n=50 436.alb	1	1	Solution	30.07	11	11.00	0.00
instance n=50 437.alb	1	1	Solution	30.04	13	12.00	7.69
instance n=50 438.alb	1	1	Solution	30.04	10	10.00	0.00
instance n=50 439.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 44.alb	1	1	Solution	30.05	25	24.00	4.00
instance n=50 440.alb	1	1	Optimal	30.02	13	13.00	0.00
instance n=50 441.alb	1	1	Solution	30.08	11	11.00	0.00
instance n=50 442.alb	1	1	Solution	30.07	12	12.00	0.00
instance n=50 443.alb	1	1	Solution	30.05	11	11.00	0.00
instance n=50 444.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 445.alb	1	1	Solution	30.06	12	12.00	0.00
instance n=50 446.alb	1	1	Solution	30.07	12	12.00	0.00
instance n=50 447.alb	1	1	Solution	30.09	13	13.00	0.00
instance n=50 448.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 449.alb	1	1	Solution	30.05	11	11.00	0.00
instance n=50 45.alb	1	1	Solution	30.07	25	24.00	4.00
instance n=50 450.alb	1	1	Solution	30.06	11	11.00	0.00
instance n=50 451.alb	1	1	Optimal	0.16	8	8.00	0.00
instance n=50 452.alb	1	1	Optimal	30.01	8	8.00	0.00
instance n=50 453.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 454.alb	1	1	Optimal	0.42	8	8.00	0.00
instance n=50 455.alb	1	1	Optimal	19.54	6	6.00	0.00
instance n=50 456.alb	1	1	Optimal	1.67	8	8.00	0.00
instance n=50 457.alb	1	1	Optimal	2.01	8	8.00	0.00
instance n=50 458.alb	1	1	Optimal	4.00	7	7.00	0.00
instance n=50 459.alb	1	1	Optimal	0.48	7	7.00	0.00
instance n=50 46.alb	1	1	Solution	30.03	29	26.00	10.34
instance n=50 460.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 461.alb	1	1	Optimal	0.07	6	6.00	0.00
instance n=50 462.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 463.alb	1	1	Optimal	6.96	8	8.00	0.00
instance n=50 464.alb	1	1	Optimal	30.01	6	6.00	0.00
instance n=50 465.alb	1	1	Optimal	30.01	8	8.00	0.00
instance n=50 466.alb	1	1	Optimal	1.81	7	7.00	0.00
instance n=50 467.alb	1	1	Optimal	0.14	9	9.00	0.00
instance n=50 468.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 469.alb	1	1	Optimal	7.38	8	8.00	0.00
instance n=50 47.alb	1	1	Solution	30.06	28	26.00	7.14
instance n=50 470.alb	1	1	Optimal	30.02	8	8.00	0.00
instance n=50 471.alb	1	1	Optimal	0.51	7	7.00	0.00
instance n=50 472.alb	1	1	Optimal	0.32	8	8.00	0.00
instance n=50 473.alb	1	1	Optimal	0.92	7	7.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 474.alb	1	1	Optimal	0.17	7	7.00	0.00
instance n=50 475.alb	1	1	Optimal	0.37	6	6.00	0.00
instance n=50 476.alb	1	1	Optimal	30.01	28	28.00	0.00
instance n=50 477.alb	1	1	Optimal	30.02	29	29.00	0.00
instance n=50 478.alb	1	1	Solution	30.03	32	30.00	6.25
instance n=50 479.alb	1	1	Optimal	30.02	28	28.00	0.00
instance n=50 48.alb	1	1	Solution	30.05	28	26.00	7.14
instance n=50 480.alb	1	1	Optimal	30.02	34	34.00	0.00
instance n=50 481.alb	1	1	Optimal	30.02	28	28.00	0.00
instance n=50 482.alb	1	1	Optimal	30.01	27	27.00	0.00
instance n=50 483.alb	1	1	Optimal	30.01	30	30.00	0.00
instance n=50 484.alb	1	1	Optimal	30.01	32	32.00	0.00
instance n=50 485.alb	1	1	Optimal	30.01	31	31.00	0.00
instance n=50 486.alb	1	1	Optimal	30.01	32	32.00	0.00
instance n=50 487.alb	1	1	Optimal	30.01	31	31.00	0.00
instance n=50 488.alb	1	1	Solution	30.04	31	29.00	6.45
instance n=50 489.alb	1	1	Solution	30.10	35	32.00	8.57
instance n=50 49.alb	1	1	Solution	30.05	25	24.00	4.00
instance n=50 490.alb	1	1	Optimal	30.01	29	29.00	0.00
instance n=50 491.alb	1	1	Solution	30.05	35	31.00	11.43
instance n=50 492.alb	1	1	Solution	30.04	29	26.00	10.34
instance n=50 493.alb	1	1	Optimal	30.02	30	30.00	0.00
instance n=50 494.alb	1	1	Optimal	30.02	32	32.00	0.00
instance n=50 495.alb	1	1	Optimal	30.02	34	34.00	0.00
instance n=50 496.alb	1	1	Optimal	30.01	29	29.00	0.00
instance n=50 497.alb	1	1	Optimal	30.02	30	30.00	0.00
instance n=50 498.alb	1	1	Optimal	30.01	30	30.00	0.00
instance n=50 499.alb	1	1	Optimal	30.01	33	33.00	0.00
instance n=50 5.alb	1	1	Optimal	30.02	7	7.00	0.00
instance n=50 50.alb	1	1	Solution	30.06	27	25.00	7.41
instance n=50 500.alb	1	1	Optimal	30.01	34	34.00	0.00
instance n=50 501.alb	1	1	Optimal	2.70	12	12.00	0.00
instance n=50 502.alb	1	1	Optimal	0.15	10	10.00	0.00
instance n=50 503.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=50 504.alb	1	1	Optimal	2.18	11	11.00	0.00
instance n=50 505.alb	1	1	Optimal	2.79	12	12.00	0.00
instance n=50 506.alb	1	1	Optimal	10.18	11	11.00	0.00
instance n=50 507.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=50 508.alb	1	1	Optimal	11.67	14	14.00	0.00
instance n=50 509.alb	1	1	Optimal	13.09	13	13.00	0.00
instance n=50 51.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 510.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=50 511.alb	1	1	Optimal	30.01	13	13.00	0.00
instance n=50 512.alb	1	1	Optimal	30.01	13	13.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 513.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=50 514.alb	1	1	Optimal	0.11	12	12.00	0.00
instance n=50 515.alb	1	1	Optimal	30.02	11	11.00	0.00
instance n=50 516.alb	1	1	Optimal	6.09	13	13.00	0.00
instance n=50 517.alb	1	1	Optimal	28.84	14	14.00	0.00
instance n=50 518.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=50 519.alb	1	1	Optimal	30.01	12	12.00	0.00
instance n=50 52.alb	1	1	Solution	30.05	11	11.00	0.00
instance n=50 520.alb	1	1	Optimal	9.20	11	11.00	0.00
instance n=50 521.alb	1	1	Optimal	0.62	10	10.00	0.00
instance n=50 522.alb	1	1	Optimal	0.46	11	11.00	0.00
instance n=50 523.alb	1	1	Optimal	5.84	11	11.00	0.00
instance n=50 524.alb	1	1	Optimal	30.02	14	14.00	0.00
instance n=50 525.alb	1	1	Optimal	30.01	11	11.00	0.00
instance n=50 53.alb	1	1	Solution	30.04	13	12.00	7.69
instance n=50 54.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 55.alb	1	1	Solution	30.04	13	13.00	0.00
instance n=50 56.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 57.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=50 58.alb	1	1	Solution	30.05	11	11.00	0.00
instance n=50 59.alb	1	1	Solution	30.06	11	11.00	0.00
instance n=50 6.alb	1	1	Optimal	10.63	6	6.00	0.00
instance n=50 60.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 61.alb	1	1	Solution	30.06	13	13.00	0.00
instance n=50 62.alb	1	1	Solution	30.05	13	13.00	0.00
instance n=50 63.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 64.alb	1	1	Solution	30.07	13	13.00	0.00
instance n=50 65.alb	1	1	Solution	30.04	12	12.00	0.00
instance n=50 66.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 67.alb	1	1	Solution	30.08	12	12.00	0.00
instance n=50 68.alb	1	1	Solution	30.06	12	12.00	0.00
instance n=50 69.alb	1	1	Solution	30.05	12	12.00	0.00
instance n=50 7.alb	1	1	Optimal	19.58	7	7.00	0.00
instance n=50 70.alb	1	1	Solution	30.04	10	10.00	0.00
instance n=50 71.alb	1	1	Solution	30.03	13	13.00	0.00
instance n=50 72.alb	1	1	Solution	30.04	11	11.00	0.00
instance n=50 73.alb	1	1	Solution	30.06	11	11.00	0.00
instance n=50 74.alb	1	1	Solution	30.03	12	12.00	0.00
instance n=50 75.alb	1	1	Solution	30.05	11	11.00	0.00
instance n=50 76.alb	1	1	Optimal	13.05	7	7.00	0.00
instance n=50 77.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 78.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 79.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 8.alb	1	1	Optimal	30.03	7	7.00	0.00

Table 6.6: Results for SALBP-1 Problems Alternative (CPSat)
(2100 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance n=50 80.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 81.alb	1	1	Solution	30.04	7	7.00	0.00
instance n=50 82.alb	1	1	Optimal	30.02	6	6.00	0.00
instance n=50 83.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 84.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 85.alb	1	1	Solution	30.06	8	8.00	0.00
instance n=50 86.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 87.alb	1	1	Solution	30.05	8	8.00	0.00
instance n=50 88.alb	1	1	Optimal	30.01	8	8.00	0.00
instance n=50 89.alb	1	1	Optimal	30.01	7	7.00	0.00
instance n=50 9.alb	1	1	Optimal	30.01	9	9.00	0.00
instance n=50 90.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 91.alb	1	1	Solution	30.06	7	7.00	0.00
instance n=50 92.alb	1	1	Solution	30.07	7	7.00	0.00
instance n=50 93.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 94.alb	1	1	Solution	30.03	7	7.00	0.00
instance n=50 95.alb	1	1	Solution	30.05	7	7.00	0.00
instance n=50 96.alb	1	1	Solution	30.06	7	7.00	0.00
instance n=50 97.alb	1	1	Optimal	30.04	7	7.00	0.00
instance n=50 98.alb	1	1	Solution	30.04	8	8.00	0.00
instance n=50 99.alb	1	1	Solution	30.04	7	7.00	0.00

Chapter 7

Test Scheduling Problems

Due to the number of instances given, we only run problems for 30 seconds, some results are still missing. The original instance data was given in Prolog format, we generate a JSON equivalent, which is used as input to create the problems.

7.1 Results for CPOptimizer

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m10r10-1.pl.json	100	10	Solution	30.24	10491	9055.00	13.69
t100m10r10-10.pl.json	100	10	Solution	30.05	9593	8369.00	12.76
t100m10r10-11.pl.json	100	10	Solution	30.06	5317	5100.00	4.08
t100m10r10-12.pl.json	100	10	Solution	30.07	6539	5613.00	14.16
t100m10r10-13.pl.json	100	10	Solution	30.05	6831	6786.00	0.66
t100m10r10-14.pl.json	100	10	Solution	30.04	5775	5257.00	8.97
t100m10r10-15.pl.json	100	10	Solution	30.04	6105	5012.00	17.90
t100m10r10-16.pl.json	100	10	Solution	30.08	12563	11589.00	7.75
t100m10r10-17.pl.json	100	10	Solution	30.09	8954	8114.00	9.38
t100m10r10-18.pl.json	100	10	Solution	30.04	10180	9304.00	8.61
t100m10r10-19.pl.json	100	10	Solution	30.09	9812	8514.00	13.23
t100m10r10-2.pl.json	100	10	Solution	30.07	11593	9807.00	15.41
t100m10r10-20.pl.json	100	10	Solution	30.15	12287	10686.00	13.03
t100m10r10-3.pl.json	100	10	Solution	30.06	6878	6379.00	7.26
t100m10r10-4.pl.json	100	10	Solution	30.11	11041	9111.00	17.48
t100m10r10-5.pl.json	100	10	Solution	30.09	12157	11823.00	2.75
t100m10r10-6.pl.json	100	10	Solution	30.06	11688	10914.00	6.62
t100m10r10-7.pl.json	100	10	Solution	30.05	6435	5732.00	10.92
t100m10r10-8.pl.json	100	10	Solution	30.10	11056	10010.00	9.46
t100m10r10-9.pl.json	100	10	Solution	30.11	9878	7991.00	19.10
t100m10r3-1.pl.json	100	10	Optimal	0.62	8711	8711.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m10r3-10.pl.json	100	10	Optimal	0.43	8958	8958.00	0.00
t100m10r3-11.pl.json	100	10	Optimal	0.15	9560	9560.00	0.00
t100m10r3-12.pl.json	100	10	Optimal	0.38	7892	7892.00	0.00
t100m10r3-13.pl.json	100	10	Optimal	0.09	10078	10077.00	0.01
t100m10r3-14.pl.json	100	10	Optimal	0.36	8681	8681.00	0.00
t100m10r3-15.pl.json	100	10	Optimal	0.17	8810	8810.00	0.00
t100m10r3-16.pl.json	100	10	Optimal	0.47	11182	11182.00	0.00
t100m10r3-17.pl.json	100	10	Optimal	0.74	7534	7534.00	0.00
t100m10r3-18.pl.json	100	10	Solution	30.10	10376	9934.00	4.26
t100m10r3-19.pl.json	100	10	Solution	30.03	7706	6970.00	9.55
t100m10r3-2.pl.json	100	10	Optimal	0.29	7082	7082.00	0.00
t100m10r3-20.pl.json	100	10	Optimal	0.17	9025	9025.00	0.00
t100m10r3-3.pl.json	100	10	Optimal	0.42	10054	10053.00	0.01
t100m10r3-4.pl.json	100	10	Optimal	0.10	13122	13121.00	0.01
t100m10r3-5.pl.json	100	10	Optimal	1.50	7545	7545.00	0.00
t100m10r3-6.pl.json	100	10	Optimal	0.93	7840	7840.00	0.00
t100m10r3-7.pl.json	100	10	Optimal	0.16	11010	11009.00	0.01
t100m10r3-8.pl.json	100	10	Optimal	0.16	9112	9112.00	0.00
t100m10r3-9.pl.json	100	10	Optimal	0.34	8532	8532.00	0.00
t100m10r5-1.pl.json	100	10	Solution	30.04	7304	7300.00	0.05
t100m10r5-10.pl.json	100	10	Optimal	1.42	6972	6972.00	0.00
t100m10r5-11.pl.json	100	10	Solution	30.08	9091	8568.00	5.75
t100m10r5-12.pl.json	100	10	Optimal	0.66	6538	6538.00	0.00
t100m10r5-13.pl.json	100	10	Optimal	0.67	8972	8972.00	0.00
t100m10r5-14.pl.json	100	10	Solution	30.07	10478	10347.00	1.25
t100m10r5-15.pl.json	100	10	Solution	30.05	5762	5647.00	2.00
t100m10r5-16.pl.json	100	10	Solution	30.04	7019	6207.00	11.57
t100m10r5-17.pl.json	100	10	Optimal	0.23	6728	6728.00	0.00
t100m10r5-18.pl.json	100	10	Solution	30.12	8987	8811.00	1.96
t100m10r5-19.pl.json	100	10	Optimal	0.98	8885	8885.00	0.00
t100m10r5-2.pl.json	100	10	Optimal	2.05	9010	9010.00	0.00
t100m10r5-20.pl.json	100	10	Optimal	0.91	7022	7022.00	0.00
t100m10r5-3.pl.json	100	10	Optimal	0.99	8820	8820.00	0.00
t100m10r5-4.pl.json	100	10	Optimal	1.02	10753	10753.00	0.00
t100m10r5-5.pl.json	100	10	Optimal	2.03	6608	6608.00	0.00
t100m10r5-6.pl.json	100	10	Solution	30.06	9452	8456.00	10.54
t100m10r5-7.pl.json	100	10	Solution	30.05	8186	7664.00	6.38
t100m10r5-8.pl.json	100	10	Solution	30.12	11383	10079.00	11.46
t100m10r5-9.pl.json	100	10	Solution	30.05	11649	10683.00	8.29
t100m20r10-1.pl.json	100	20	Solution	30.19	12412	12180.00	1.87
t100m20r10-10.pl.json	100	20	Solution	30.05	12646	10953.00	13.39
t100m20r10-11.pl.json	100	20	Solution	30.09	8687	7289.00	16.09
t100m20r10-12.pl.json	100	20	Solution	30.20	7391	6774.00	8.35
t100m20r10-13.pl.json	100	20	Solution	30.08	9695	9229.00	4.81

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m20r10-14.pl.json	100	20	Solution	30.16	10027	8652.00	13.71
t100m20r10-15.pl.json	100	20	Solution	30.04	6544	5362.00	18.06
t100m20r10-16.pl.json	100	20	Solution	30.10	9264	8343.00	9.94
t100m20r10-17.pl.json	100	20	Solution	30.15	8611	7381.00	14.28
t100m20r10-18.pl.json	100	20	Optimal	1.74	4843	4843.00	0.00
t100m20r10-19.pl.json	100	20	Solution	30.16	12320	11752.00	4.61
t100m20r10-2.pl.json	100	20	Solution	30.14	7740	6890.00	10.98
t100m20r10-20.pl.json	100	20	Solution	30.11	9873	8562.00	13.28
t100m20r10-3.pl.json	100	20	Solution	30.07	7133	6295.00	11.75
t100m20r10-4.pl.json	100	20	Solution	30.21	9510	9052.00	4.82
t100m20r10-5.pl.json	100	20	Solution	30.13	9230	8459.00	8.35
t100m20r10-6.pl.json	100	20	Solution	30.10	8781	7619.00	13.23
t100m20r10-7.pl.json	100	20	Solution	30.18	11313	9767.00	13.67
t100m20r10-8.pl.json	100	20	Solution	30.12	7096	7041.00	0.78
t100m20r10-9.pl.json	100	20	Solution	30.19	10835	10019.00	7.53
t100m20r3-1.pl.json	100	20	Optimal	0.59	6585	6585.00	0.00
t100m20r3-10.pl.json	100	20	Optimal	0.28	8535	8535.00	0.00
t100m20r3-11.pl.json	100	20	Optimal	0.60	9084	9084.00	0.00
t100m20r3-12.pl.json	100	20	Optimal	0.28	9066	9066.00	0.00
t100m20r3-13.pl.json	100	20	Solution	30.09	11412	9974.00	12.60
t100m20r3-14.pl.json	100	20	Optimal	0.54	8786	8786.00	0.00
t100m20r3-15.pl.json	100	20	Optimal	0.27	10205	10204.00	0.01
t100m20r3-16.pl.json	100	20	Optimal	0.28	8856	8856.00	0.00
t100m20r3-17.pl.json	100	20	Optimal	1.30	5451	5451.00	0.00
t100m20r3-18.pl.json	100	20	Optimal	0.51	8752	8752.00	0.00
t100m20r3-19.pl.json	100	20	Solution	30.13	8909	8860.00	0.55
t100m20r3-2.pl.json	100	20	Optimal	0.26	8498	8498.00	0.00
t100m20r3-20.pl.json	100	20	Optimal	0.87	7880	7880.00	0.00
t100m20r3-3.pl.json	100	20	Solution	30.21	12170	11987.00	1.50
t100m20r3-4.pl.json	100	20	Optimal	0.53	12258	12257.00	0.01
t100m20r3-5.pl.json	100	20	Optimal	0.25	11932	11931.00	0.01
t100m20r3-6.pl.json	100	20	Optimal	0.28	8531	8531.00	0.00
t100m20r3-7.pl.json	100	20	Optimal	0.28	6512	6512.00	0.00
t100m20r3-8.pl.json	100	20	Optimal	3.31	10690	10689.00	0.01
t100m20r3-9.pl.json	100	20	Optimal	0.30	8255	8255.00	0.00
t100m20r5-1.pl.json	100	20	Optimal	0.34	9098	9098.00	0.00
t100m20r5-10.pl.json	100	20	Solution	30.04	8340	7964.00	4.51
t100m20r5-11.pl.json	100	20	Solution	30.11	6828	5564.00	18.51
t100m20r5-12.pl.json	100	20	Optimal	3.25	8704	8704.00	0.00
t100m20r5-13.pl.json	100	20	Optimal	0.70	8880	8880.00	0.00
t100m20r5-14.pl.json	100	20	Solution	30.26	10590	9727.00	8.15
t100m20r5-15.pl.json	100	20	Optimal	0.59	8953	8953.00	0.00
t100m20r5-16.pl.json	100	20	Solution	30.15	7864	7594.00	3.43
t100m20r5-17.pl.json	100	20	Solution	30.15	5685	5524.00	2.83

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m20r5-18.pl.json	100	20	Optimal	1.06	6617	6617.00	0.00
t100m20r5-19.pl.json	100	20	Optimal	0.42	9461	9461.00	0.00
t100m20r5-2.pl.json	100	20	Optimal	0.38	9566	9566.00	0.00
t100m20r5-20.pl.json	100	20	Solution	30.06	11569	10228.00	11.59
t100m20r5-3.pl.json	100	20	Optimal	1.74	9366	9366.00	0.00
t100m20r5-4.pl.json	100	20	Solution	30.07	14108	12456.00	11.71
t100m20r5-5.pl.json	100	20	Optimal	0.35	8585	8585.00	0.00
t100m20r5-6.pl.json	100	20	Solution	30.12	7528	6539.00	13.14
t100m20r5-7.pl.json	100	20	Solution	30.13	11254	10099.00	10.26
t100m20r5-8.pl.json	100	20	Optimal	2.49	5812	5812.00	0.00
t100m20r5-9.pl.json	100	20	Solution	30.16	6634	6496.00	2.08
t100m50r10-1.pl.json	100	50	Solution	30.17	7299	6941.00	4.90
t100m50r10-10.pl.json	100	50	Solution	30.23	5201	5108.00	1.79
t100m50r10-11.pl.json	100	50	Solution	30.09	4970	4782.00	3.78
t100m50r10-12.pl.json	100	50	Solution	30.06	9335	9122.00	2.28
t100m50r10-13.pl.json	100	50	Solution	30.26	9759	8828.00	9.54
t100m50r10-14.pl.json	100	50	Solution	30.10	10704	8290.00	22.55
t100m50r10-15.pl.json	100	50	Solution	30.08	8637	7804.00	9.64
t100m50r10-16.pl.json	100	50	Solution	30.14	14087	12381.00	12.11
t100m50r10-17.pl.json	100	50	Solution	30.18	9600	9151.00	4.68
t100m50r10-18.pl.json	100	50	Solution	30.34	7214	7120.00	1.30
t100m50r10-19.pl.json	100	50	Solution	30.18	8559	8059.00	5.84
t100m50r10-2.pl.json	100	50	Solution	30.25	7968	7568.00	5.02
t100m50r10-20.pl.json	100	50	Solution	30.09	8421	7939.00	5.72
t100m50r10-3.pl.json	100	50	Optimal	0.33	6937	6937.00	0.00
t100m50r10-4.pl.json	100	50	Solution	30.16	9952	8525.00	14.34
t100m50r10-5.pl.json	100	50	Optimal	1.35	9859	9859.00	0.00
t100m50r10-6.pl.json	100	50	Solution	30.31	7696	6837.00	11.16
t100m50r10-7.pl.json	100	50	Optimal	1.17	9542	9542.00	0.00
t100m50r10-8.pl.json	100	50	Solution	30.07	10719	9176.00	14.39
t100m50r10-9.pl.json	100	50	Solution	30.07	10411	9375.00	9.95
t100m50r3-1.pl.json	100	50	Optimal	0.46	9937	9937.00	0.00
t100m50r3-10.pl.json	100	50	Solution	30.06	8946	8877.00	0.77
t100m50r3-11.pl.json	100	50	Optimal	1.01	6141	6141.00	0.00
t100m50r3-12.pl.json	100	50	Optimal	0.87	6473	6473.00	0.00
t100m50r3-13.pl.json	100	50	Optimal	0.47	8653	8653.00	0.00
t100m50r3-14.pl.json	100	50	Solution	30.09	13018	12796.00	1.71
t100m50r3-15.pl.json	100	50	Optimal	3.29	9056	9056.00	0.00
t100m50r3-16.pl.json	100	50	Optimal	0.41	8680	8680.00	0.00
t100m50r3-17.pl.json	100	50	Optimal	0.55	8197	8197.00	0.00
t100m50r3-18.pl.json	100	50	Optimal	0.38	9318	9318.00	0.00
t100m50r3-19.pl.json	100	50	Optimal	0.35	12265	12264.00	0.01
t100m50r3-2.pl.json	100	50	Optimal	0.79	11030	11029.00	0.01
t100m50r3-20.pl.json	100	50	Optimal	0.38	7662	7662.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m50r3-3.pl.json	100	50	Optimal	0.46	5348	5348.00	0.00
t100m50r3-4.pl.json	100	50	Optimal	2.02	7800	7800.00	0.00
t100m50r3-5.pl.json	100	50	Optimal	0.83	4207	4207.00	0.00
t100m50r3-6.pl.json	100	50	Optimal	6.31	10596	10596.00	0.00
t100m50r3-7.pl.json	100	50	Optimal	0.43	7826	7826.00	0.00
t100m50r3-8.pl.json	100	50	Optimal	0.81	7865	7865.00	0.00
t100m50r3-9.pl.json	100	50	Optimal	0.48	7891	7891.00	0.00
t100m50r5-1.pl.json	100	50	Optimal	0.78	7926	7926.00	0.00
t100m50r5-10.pl.json	100	50	Solution	30.23	7299	6521.00	10.66
t100m50r5-11.pl.json	100	50	Optimal	1.56	9417	9417.00	0.00
t100m50r5-12.pl.json	100	50	Optimal	3.81	8824	8824.00	0.00
t100m50r5-13.pl.json	100	50	Solution	30.05	10473	9115.00	12.97
t100m50r5-14.pl.json	100	50	Solution	30.33	7503	7134.00	4.92
t100m50r5-15.pl.json	100	50	Solution	30.06	10141	9853.00	2.84
t100m50r5-16.pl.json	100	50	Optimal	0.47	6481	6481.00	0.00
t100m50r5-17.pl.json	100	50	Optimal	0.50	6129	6129.00	0.00
t100m50r5-18.pl.json	100	50	Solution	30.06	9100	8337.00	8.38
t100m50r5-19.pl.json	100	50	Solution	30.20	6762	6356.00	6.00
t100m50r5-2.pl.json	100	50	Optimal	1.00	6651	6651.00	0.00
t100m50r5-20.pl.json	100	50	Solution	30.05	6894	6667.00	3.29
t100m50r5-3.pl.json	100	50	Solution	30.19	7944	7857.00	1.10
t100m50r5-4.pl.json	100	50	Optimal	1.39	8296	8296.00	0.00
t100m50r5-5.pl.json	100	50	Optimal	1.26	9977	9977.00	0.00
t100m50r5-6.pl.json	100	50	Optimal	0.91	8240	8240.00	0.00
t100m50r5-7.pl.json	100	50	Optimal	1.34	10904	10903.00	0.01
t100m50r5-8.pl.json	100	50	Optimal	0.90	8293	8293.00	0.00
t100m50r5-9.pl.json	100	50	Solution	30.06	7879	7622.00	3.26
t20m10r10-1.pl.json	20	10	Optimal	0.07	1337	1337.00	0.00
t20m10r10-10.pl.json	20	10	Optimal	0.05	3882	3882.00	0.00
t20m10r10-11.pl.json	20	10	Optimal	0.06	2002	2002.00	0.00
t20m10r10-12.pl.json	20	10	Optimal	0.31	1257	1257.00	0.00
t20m10r10-13.pl.json	20	10	Optimal	0.06	2110	2110.00	0.00
t20m10r10-14.pl.json	20	10	Optimal	2.43	2546	2546.00	0.00
t20m10r10-15.pl.json	20	10	Optimal	0.05	3344	3344.00	0.00
t20m10r10-16.pl.json	20	10	Optimal	3.87	1643	1643.00	0.00
t20m10r10-17.pl.json	20	10	Optimal	0.43	1069	1069.00	0.00
t20m10r10-18.pl.json	20	10	Optimal	0.04	3041	3041.00	0.00
t20m10r10-19.pl.json	20	10	Optimal	0.04	2422	2422.00	0.00
t20m10r10-2.pl.json	20	10	Optimal	0.05	1819	1819.00	0.00
t20m10r10-20.pl.json	20	10	Optimal	0.05	1595	1595.00	0.00
t20m10r10-3.pl.json	20	10	Solution	30.02	843	771.00	8.54
t20m10r10-4.pl.json	20	10	Optimal	0.04	1396	1396.00	0.00
t20m10r10-5.pl.json	20	10	Optimal	0.05	1710	1710.00	0.00
t20m10r10-6.pl.json	20	10	Optimal	0.03	2434	2434.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t20m10r10-7.pl.json	20	10	Optimal	0.41	2696	2696.00	0.00
t20m10r10-8.pl.json	20	10	Optimal	0.03	1329	1329.00	0.00
t20m10r10-9.pl.json	20	10	Optimal	4.48	2933	2933.00	0.00
t20m10r3-1.pl.json	20	10	Optimal	0.05	1876	1876.00	0.00
t20m10r3-10.pl.json	20	10	Optimal	0.05	1652	1652.00	0.00
t20m10r3-11.pl.json	20	10	Optimal	0.04	1640	1640.00	0.00
t20m10r3-12.pl.json	20	10	Optimal	0.03	1758	1758.00	0.00
t20m10r3-13.pl.json	20	10	Optimal	0.03	3099	3099.00	0.00
t20m10r3-14.pl.json	20	10	Solution	30.01	3891	3520.00	9.53
t20m10r3-15.pl.json	20	10	Optimal	0.05	1433	1433.00	0.00
t20m10r3-16.pl.json	20	10	Optimal	0.04	1564	1564.00	0.00
t20m10r3-17.pl.json	20	10	Optimal	0.04	2321	2321.00	0.00
t20m10r3-18.pl.json	20	10	Solution	30.01	821	746.00	9.14
t20m10r3-19.pl.json	20	10	Optimal	0.09	1236	1236.00	0.00
t20m10r3-2.pl.json	20	10	Optimal	0.05	3258	3258.00	0.00
t20m10r3-20.pl.json	20	10	Optimal	0.04	2168	2168.00	0.00
t20m10r3-3.pl.json	20	10	Optimal	0.03	2255	2255.00	0.00
t20m10r3-4.pl.json	20	10	Optimal	0.03	2707	2707.00	0.00
t20m10r3-5.pl.json	20	10	Optimal	0.05	2381	2381.00	0.00
t20m10r3-6.pl.json	20	10	Optimal	0.03	3043	3043.00	0.00
t20m10r3-7.pl.json	20	10	Optimal	0.05	1738	1738.00	0.00
t20m10r3-8.pl.json	20	10	Optimal	2.74	1278	1278.00	0.00
t20m10r3-9.pl.json	20	10	Optimal	0.04	2874	2874.00	0.00
t20m10r5-1.pl.json	20	10	Optimal	0.04	2586	2586.00	0.00
t20m10r5-10.pl.json	20	10	Optimal	0.05	2260	2260.00	0.00
t20m10r5-11.pl.json	20	10	Optimal	0.03	3487	3487.00	0.00
t20m10r5-12.pl.json	20	10	Optimal	0.03	1559	1559.00	0.00
t20m10r5-13.pl.json	20	10	Optimal	0.22	1457	1457.00	0.00
t20m10r5-14.pl.json	20	10	Optimal	0.06	1141	1141.00	0.00
t20m10r5-15.pl.json	20	10	Optimal	0.18	821	821.00	0.00
t20m10r5-16.pl.json	20	10	Optimal	0.03	2910	2910.00	0.00
t20m10r5-17.pl.json	20	10	Optimal	0.05	2337	2337.00	0.00
t20m10r5-18.pl.json	20	10	Optimal	3.96	2920	2920.00	0.00
t20m10r5-19.pl.json	20	10	Optimal	0.03	1952	1952.00	0.00
t20m10r5-2.pl.json	20	10	Optimal	0.03	1639	1639.00	0.00
t20m10r5-20.pl.json	20	10	Optimal	0.03	2660	2660.00	0.00
t20m10r5-3.pl.json	20	10	Optimal	0.05	1406	1406.00	0.00
t20m10r5-4.pl.json	20	10	Optimal	0.05	2658	2658.00	0.00
t20m10r5-5.pl.json	20	10	Optimal	0.08	794	794.00	0.00
t20m10r5-6.pl.json	20	10	Optimal	0.03	2398	2398.00	0.00
t20m10r5-7.pl.json	20	10	Optimal	0.04	1430	1430.00	0.00
t20m10r5-8.pl.json	20	10	Optimal	0.06	976	976.00	0.00
t20m10r5-9.pl.json	20	10	Optimal	0.04	2953	2953.00	0.00
t30m10r10-1.pl.json	30	10	Optimal	6.81	3344	3344.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t30m10r10-10.pl.json	30	10	Solution	30.03	4692	4146.00	11.64
t30m10r10-11.pl.json	30	10	Optimal	0.06	2905	2905.00	0.00
t30m10r10-12.pl.json	30	10	Optimal	0.06	3672	3672.00	0.00
t30m10r10-13.pl.json	30	10	Optimal	0.36	2778	2778.00	0.00
t30m10r10-14.pl.json	30	10	Optimal	2.31	2741	2741.00	0.00
t30m10r10-15.pl.json	30	10	Optimal	0.05	2388	2388.00	0.00
t30m10r10-16.pl.json	30	10	Solution	30.03	4225	3900.00	7.69
t30m10r10-17.pl.json	30	10	Optimal	0.08	1504	1504.00	0.00
t30m10r10-18.pl.json	30	10	Solution	30.03	3287	2730.00	16.95
t30m10r10-19.pl.json	30	10	Optimal	0.05	3874	3874.00	0.00
t30m10r10-2.pl.json	30	10	Optimal	0.03	3169	3169.00	0.00
t30m10r10-20.pl.json	30	10	Optimal	0.05	2691	2691.00	0.00
t30m10r10-3.pl.json	30	10	Solution	30.01	3360	2851.00	15.15
t30m10r10-4.pl.json	30	10	Optimal	0.06	3452	3452.00	0.00
t30m10r10-5.pl.json	30	10	Optimal	0.05	2785	2785.00	0.00
t30m10r10-6.pl.json	30	10	Solution	30.03	1013	775.00	23.49
t30m10r10-7.pl.json	30	10	Optimal	27.69	3755	3755.00	0.00
t30m10r10-8.pl.json	30	10	Solution	30.02	4613	4160.00	9.82
t30m10r10-9.pl.json	30	10	Optimal	0.03	2770	2770.00	0.00
t30m10r3-1.pl.json	30	10	Optimal	0.05	2901	2901.00	0.00
t30m10r3-10.pl.json	30	10	Optimal	0.04	4829	4829.00	0.00
t30m10r3-11.pl.json	30	10	Optimal	0.04	2584	2584.00	0.00
t30m10r3-12.pl.json	30	10	Optimal	0.03	2130	2130.00	0.00
t30m10r3-13.pl.json	30	10	Optimal	0.03	4253	4253.00	0.00
t30m10r3-14.pl.json	30	10	Optimal	0.17	1393	1393.00	0.00
t30m10r3-15.pl.json	30	10	Optimal	0.03	4149	4149.00	0.00
t30m10r3-16.pl.json	30	10	Optimal	0.05	2027	2027.00	0.00
t30m10r3-17.pl.json	30	10	Optimal	0.05	2975	2975.00	0.00
t30m10r3-18.pl.json	30	10	Optimal	0.05	5477	5477.00	0.00
t30m10r3-19.pl.json	30	10	Solution	30.01	1289	1042.00	19.16
t30m10r3-2.pl.json	30	10	Optimal	0.14	2523	2523.00	0.00
t30m10r3-20.pl.json	30	10	Optimal	0.05	4754	4754.00	0.00
t30m10r3-3.pl.json	30	10	Optimal	0.04	2793	2793.00	0.00
t30m10r3-4.pl.json	30	10	Optimal	0.69	2809	2809.00	0.00
t30m10r3-5.pl.json	30	10	Optimal	0.04	3758	3758.00	0.00
t30m10r3-6.pl.json	30	10	Optimal	0.05	2870	2870.00	0.00
t30m10r3-7.pl.json	30	10	Optimal	0.05	2122	2122.00	0.00
t30m10r3-8.pl.json	30	10	Optimal	0.03	2862	2862.00	0.00
t30m10r3-9.pl.json	30	10	Optimal	0.08	2754	2754.00	0.00
t30m10r5-1.pl.json	30	10	Optimal	0.04	1998	1998.00	0.00
t30m10r5-10.pl.json	30	10	Optimal	0.04	3743	3743.00	0.00
t30m10r5-11.pl.json	30	10	Optimal	0.05	2138	2138.00	0.00
t30m10r5-12.pl.json	30	10	Optimal	0.05	2251	2251.00	0.00
t30m10r5-13.pl.json	30	10	Optimal	0.05	2632	2632.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t30m10r5-14.pl.json	30	10	Optimal	0.06	2201	2201.00	0.00
t30m10r5-15.pl.json	30	10	Optimal	0.09	2339	2339.00	0.00
t30m10r5-16.pl.json	30	10	Optimal	0.05	4293	4293.00	0.00
t30m10r5-17.pl.json	30	10	Optimal	0.11	1314	1314.00	0.00
t30m10r5-18.pl.json	30	10	Optimal	0.07	2169	2169.00	0.00
t30m10r5-19.pl.json	30	10	Solution	30.01	1346	1279.00	4.98
t30m10r5-2.pl.json	30	10	Optimal	0.05	2399	2399.00	0.00
t30m10r5-20.pl.json	30	10	Optimal	0.05	1486	1486.00	0.00
t30m10r5-3.pl.json	30	10	Optimal	0.05	2494	2494.00	0.00
t30m10r5-4.pl.json	30	10	Optimal	0.03	3405	3405.00	0.00
t30m10r5-5.pl.json	30	10	Solution	30.02	5243	4550.00	13.22
t30m10r5-6.pl.json	30	10	Optimal	0.05	2382	2382.00	0.00
t30m10r5-7.pl.json	30	10	Optimal	0.06	2018	2018.00	0.00
t30m10r5-8.pl.json	30	10	Optimal	0.04	3089	3089.00	0.00
t30m10r5-9.pl.json	30	10	Optimal	0.05	3704	3704.00	0.00
t30m20r10-1.pl.json	30	20	Solution	30.03	3702	2850.00	23.01
t30m20r10-10.pl.json	30	20	Optimal	4.79	2508	2508.00	0.00
t30m20r10-11.pl.json	30	20	Solution	30.02	3648	3482.00	4.55
t30m20r10-12.pl.json	30	20	Optimal	0.09	4214	4214.00	0.00
t30m20r10-13.pl.json	30	20	Optimal	15.77	3980	3980.00	0.00
t30m20r10-14.pl.json	30	20	Optimal	13.92	3141	3141.00	0.00
t30m20r10-15.pl.json	30	20	Solution	30.02	4322	3457.00	20.01
t30m20r10-16.pl.json	30	20	Optimal	0.11	4002	4002.00	0.00
t30m20r10-17.pl.json	30	20	Solution	30.02	4161	3363.00	19.18
t30m20r10-18.pl.json	30	20	Optimal	6.32	1992	1992.00	0.00
t30m20r10-19.pl.json	30	20	Solution	30.04	2789	2250.00	19.33
t30m20r10-2.pl.json	30	20	Solution	30.02	3982	3447.00	13.44
t30m20r10-20.pl.json	30	20	Optimal	5.60	2314	2314.00	0.00
t30m20r10-3.pl.json	30	20	Optimal	0.09	2158	2158.00	0.00
t30m20r10-4.pl.json	30	20	Solution	30.03	4040	3217.00	20.37
t30m20r10-5.pl.json	30	20	Optimal	0.09	1237	1237.00	0.00
t30m20r10-6.pl.json	30	20	Solution	30.04	3770	3600.00	4.51
t30m20r10-7.pl.json	30	20	Optimal	0.08	2266	2266.00	0.00
t30m20r10-8.pl.json	30	20	Optimal	2.08	1855	1855.00	0.00
t30m20r10-9.pl.json	30	20	Optimal	3.60	2028	2028.00	0.00
t30m20r3-1.pl.json	30	20	Optimal	0.08	2200	2200.00	0.00
t30m20r3-10.pl.json	30	20	Optimal	0.07	3291	3291.00	0.00
t30m20r3-11.pl.json	30	20	Optimal	0.08	4473	4473.00	0.00
t30m20r3-12.pl.json	30	20	Solution	30.02	5060	4931.00	2.55
t30m20r3-13.pl.json	30	20	Optimal	0.07	3536	3536.00	0.00
t30m20r3-14.pl.json	30	20	Optimal	0.08	3432	3432.00	0.00
t30m20r3-15.pl.json	30	20	Optimal	0.08	3463	3463.00	0.00
t30m20r3-16.pl.json	30	20	Optimal	0.07	3893	3893.00	0.00
t30m20r3-17.pl.json	30	20	Optimal	0.07	1892	1892.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t30m20r3-18.pl.json	30	20	Optimal	0.08	2653	2653.00	0.00
t30m20r3-19.pl.json	30	20	Optimal	0.08	3141	3141.00	0.00
t30m20r3-2.pl.json	30	20	Optimal	0.08	1251	1251.00	0.00
t30m20r3-20.pl.json	30	20	Optimal	5.77	2745	2745.00	0.00
t30m20r3-3.pl.json	30	20	Optimal	0.08	3434	3434.00	0.00
t30m20r3-4.pl.json	30	20	Optimal	0.10	2394	2394.00	0.00
t30m20r3-5.pl.json	30	20	Optimal	0.06	3776	3776.00	0.00
t30m20r3-6.pl.json	30	20	Optimal	0.08	2250	2250.00	0.00
t30m20r3-7.pl.json	30	20	Optimal	0.12	1693	1693.00	0.00
t30m20r3-8.pl.json	30	20	Optimal	0.08	4997	4997.00	0.00
t30m20r3-9.pl.json	30	20	Optimal	0.08	4898	4898.00	0.00
t30m20r5-1.pl.json	30	20	Solution	30.02	3195	2787.00	12.77
t30m20r5-10.pl.json	30	20	Optimal	5.14	2133	2133.00	0.00
t30m20r5-11.pl.json	30	20	Optimal	0.08	3974	3974.00	0.00
t30m20r5-12.pl.json	30	20	Optimal	0.08	2197	2197.00	0.00
t30m20r5-13.pl.json	30	20	Optimal	0.09	2296	2296.00	0.00
t30m20r5-14.pl.json	30	20	Optimal	0.07	3861	3861.00	0.00
t30m20r5-15.pl.json	30	20	Optimal	0.08	2353	2353.00	0.00
t30m20r5-16.pl.json	30	20	Optimal	4.27	2751	2751.00	0.00
t30m20r5-17.pl.json	30	20	Optimal	0.08	3555	3555.00	0.00
t30m20r5-18.pl.json	30	20	Optimal	0.06	2384	2384.00	0.00
t30m20r5-19.pl.json	30	20	Optimal	0.11	2080	2080.00	0.00
t30m20r5-2.pl.json	30	20	Optimal	0.10	1715	1715.00	0.00
t30m20r5-20.pl.json	30	20	Optimal	0.10	4176	4176.00	0.00
t30m20r5-3.pl.json	30	20	Solution	30.05	4528	4037.00	10.84
t30m20r5-4.pl.json	30	20	Optimal	0.09	3083	3083.00	0.00
t30m20r5-5.pl.json	30	20	Optimal	0.08	1969	1969.00	0.00
t30m20r5-6.pl.json	30	20	Optimal	0.08	4250	4250.00	0.00
t30m20r5-7.pl.json	30	20	Optimal	0.08	3036	3036.00	0.00
t30m20r5-8.pl.json	30	20	Optimal	1.55	2834	2834.00	0.00
t30m20r5-9.pl.json	30	20	Optimal	0.10	2343	2343.00	0.00
t40m10r10-1.pl.json	40	10	Optimal	0.11	2514	2514.00	0.00
t40m10r10-10.pl.json	40	10	Optimal	0.08	3557	3557.00	0.00
t40m10r10-11.pl.json	40	10	Solution	30.03	4556	4262.00	6.45
t40m10r10-12.pl.json	40	10	Solution	30.01	5225	4355.00	16.65
t40m10r10-13.pl.json	40	10	Optimal	16.47	2789	2789.00	0.00
t40m10r10-14.pl.json	40	10	Optimal	0.47	1648	1648.00	0.00
t40m10r10-15.pl.json	40	10	Optimal	2.03	1844	1844.00	0.00
t40m10r10-16.pl.json	40	10	Solution	30.02	3749	3380.00	9.84
t40m10r10-17.pl.json	40	10	Optimal	0.14	2363	2363.00	0.00
t40m10r10-18.pl.json	40	10	Optimal	0.06	4973	4973.00	0.00
t40m10r10-19.pl.json	40	10	Optimal	0.06	3181	3181.00	0.00
t40m10r10-2.pl.json	40	10	Optimal	0.20	2350	2350.00	0.00
t40m10r10-20.pl.json	40	10	Solution	30.04	2730	2470.00	9.52

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t40m10r10-3.pl.json	40	10	Optimal	0.06	3717	3717.00	0.00
t40m10r10-4.pl.json	40	10	Optimal	0.08	3414	3414.00	0.00
t40m10r10-5.pl.json	40	10	Optimal	5.68	2852	2852.00	0.00
t40m10r10-6.pl.json	40	10	Solution	30.02	3262	2910.00	10.79
t40m10r10-7.pl.json	40	10	Optimal	0.08	4572	4572.00	0.00
t40m10r10-8.pl.json	40	10	Solution	30.03	3776	3385.00	10.35
t40m10r10-9.pl.json	40	10	Optimal	0.11	2524	2524.00	0.00
t40m10r3-1.pl.json	40	10	Optimal	0.09	4832	4832.00	0.00
t40m10r3-10.pl.json	40	10	Optimal	0.15	2442	2442.00	0.00
t40m10r3-11.pl.json	40	10	Optimal	0.06	3218	3218.00	0.00
t40m10r3-12.pl.json	40	10	Optimal	0.06	3863	3863.00	0.00
t40m10r3-13.pl.json	40	10	Optimal	0.07	3564	3564.00	0.00
t40m10r3-14.pl.json	40	10	Optimal	0.08	4913	4913.00	0.00
t40m10r3-15.pl.json	40	10	Optimal	0.26	3785	3785.00	0.00
t40m10r3-16.pl.json	40	10	Optimal	0.11	2840	2840.00	0.00
t40m10r3-17.pl.json	40	10	Optimal	0.06	5506	5506.00	0.00
t40m10r3-18.pl.json	40	10	Optimal	0.08	3848	3848.00	0.00
t40m10r3-19.pl.json	40	10	Optimal	0.11	2259	2259.00	0.00
t40m10r3-2.pl.json	40	10	Solution	30.04	1727	1589.00	7.99
t40m10r3-20.pl.json	40	10	Optimal	0.09	4157	4157.00	0.00
t40m10r3-3.pl.json	40	10	Optimal	0.08	4903	4903.00	0.00
t40m10r3-4.pl.json	40	10	Solution	30.03	1635	1341.00	17.98
t40m10r3-5.pl.json	40	10	Optimal	0.16	1984	1984.00	0.00
t40m10r3-6.pl.json	40	10	Optimal	0.06	5005	5005.00	0.00
t40m10r3-7.pl.json	40	10	Solution	30.03	5545	5188.00	6.44
t40m10r3-8.pl.json	40	10	Optimal	0.08	3658	3658.00	0.00
t40m10r3-9.pl.json	40	10	Optimal	0.19	3830	3830.00	0.00
t40m10r5-1.pl.json	40	10	Optimal	0.08	4857	4857.00	0.00
t40m10r5-10.pl.json	40	10	Optimal	0.08	3989	3989.00	0.00
t40m10r5-11.pl.json	40	10	Optimal	0.08	5238	5238.00	0.00
t40m10r5-12.pl.json	40	10	Optimal	0.08	4584	4584.00	0.00
t40m10r5-13.pl.json	40	10	Optimal	0.09	2307	2307.00	0.00
t40m10r5-14.pl.json	40	10	Optimal	0.30	1826	1826.00	0.00
t40m10r5-15.pl.json	40	10	Optimal	0.11	1926	1926.00	0.00
t40m10r5-16.pl.json	40	10	Optimal	0.11	5216	5216.00	0.00
t40m10r5-17.pl.json	40	10	Optimal	0.08	7162	7162.00	0.00
t40m10r5-18.pl.json	40	10	Optimal	0.11	4892	4892.00	0.00
t40m10r5-19.pl.json	40	10	Optimal	0.08	4027	4027.00	0.00
t40m10r5-2.pl.json	40	10	Optimal	8.38	4099	4099.00	0.00
t40m10r5-20.pl.json	40	10	Solution	30.02	4899	4755.00	2.94
t40m10r5-3.pl.json	40	10	Optimal	0.08	3113	3113.00	0.00
t40m10r5-4.pl.json	40	10	Optimal	0.10	6626	6626.00	0.00
t40m10r5-5.pl.json	40	10	Optimal	0.08	3828	3828.00	0.00
t40m10r5-6.pl.json	40	10	Optimal	0.09	4213	4213.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t40m10r5-7.pl.json	40	10	Optimal	0.28	4303	4303.00	0.00
t40m10r5-8.pl.json	40	10	Solution	30.03	3559	3189.00	10.40
t40m10r5-9.pl.json	40	10	Optimal	0.41	1953	1953.00	0.00
t40m20r10-1.pl.json	40	20	Solution	30.09	4518	3972.00	12.08
t40m20r10-10.pl.json	40	20	Optimal	12.43	3862	3862.00	0.00
t40m20r10-11.pl.json	40	20	Optimal	0.14	1952	1952.00	0.00
t40m20r10-12.pl.json	40	20	Optimal	0.14	4129	4129.00	0.00
t40m20r10-13.pl.json	40	20	Optimal	0.28	2927	2927.00	0.00
t40m20r10-14.pl.json	40	20	Solution	30.05	2701	2381.00	11.85
t40m20r10-15.pl.json	40	20	Optimal	11.77	3168	3168.00	0.00
t40m20r10-16.pl.json	40	20	Optimal	0.14	2812	2812.00	0.00
t40m20r10-17.pl.json	40	20	Solution	30.07	4288	3718.00	13.29
t40m20r10-18.pl.json	40	20	Solution	30.05	3611	3194.00	11.55
t40m20r10-19.pl.json	40	20	Optimal	12.23	2891	2891.00	0.00
t40m20r10-2.pl.json	40	20	Optimal	8.74	3284	3284.00	0.00
t40m20r10-20.pl.json	40	20	Solution	30.04	5506	4945.00	10.19
t40m20r10-3.pl.json	40	20	Solution	30.08	5981	5478.00	8.41
t40m20r10-4.pl.json	40	20	Optimal	0.14	3409	3409.00	0.00
t40m20r10-5.pl.json	40	20	Solution	30.06	5113	4278.00	16.33
t40m20r10-6.pl.json	40	20	Solution	30.03	2376	2333.00	1.81
t40m20r10-7.pl.json	40	20	Solution	30.06	4799	4243.00	11.59
t40m20r10-8.pl.json	40	20	Solution	30.02	3924	3327.00	15.21
t40m20r10-9.pl.json	40	20	Optimal	3.86	2043	2043.00	0.00
t40m20r3-1.pl.json	40	20	Optimal	0.16	3524	3524.00	0.00
t40m20r3-10.pl.json	40	20	Optimal	0.19	3110	3110.00	0.00
t40m20r3-11.pl.json	40	20	Optimal	0.15	3695	3695.00	0.00
t40m20r3-12.pl.json	40	20	Optimal	0.24	4828	4828.00	0.00
t40m20r3-13.pl.json	40	20	Optimal	0.25	4010	4010.00	0.00
t40m20r3-14.pl.json	40	20	Optimal	0.14	2752	2752.00	0.00
t40m20r3-15.pl.json	40	20	Optimal	0.16	3312	3312.00	0.00
t40m20r3-16.pl.json	40	20	Optimal	0.16	4304	4304.00	0.00
t40m20r3-17.pl.json	40	20	Optimal	0.17	3991	3991.00	0.00
t40m20r3-18.pl.json	40	20	Optimal	0.17	5733	5733.00	0.00
t40m20r3-19.pl.json	40	20	Optimal	0.17	3581	3581.00	0.00
t40m20r3-2.pl.json	40	20	Optimal	0.17	4869	4869.00	0.00
t40m20r3-20.pl.json	40	20	Optimal	0.17	3514	3514.00	0.00
t40m20r3-3.pl.json	40	20	Optimal	0.24	2503	2503.00	0.00
t40m20r3-4.pl.json	40	20	Optimal	0.13	4323	4323.00	0.00
t40m20r3-5.pl.json	40	20	Optimal	0.17	3626	3626.00	0.00
t40m20r3-6.pl.json	40	20	Optimal	0.17	2488	2488.00	0.00
t40m20r3-7.pl.json	40	20	Optimal	0.17	3470	3470.00	0.00
t40m20r3-8.pl.json	40	20	Optimal	0.24	6730	6730.00	0.00
t40m20r3-9.pl.json	40	20	Optimal	0.20	4656	4656.00	0.00
t40m20r5-1.pl.json	40	20	Optimal	0.28	1318	1318.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t40m20r5-10.pl.json	40	20	Optimal	0.25	2216	2216.00	0.00
t40m20r5-11.pl.json	40	20	Optimal	0.25	3538	3538.00	0.00
t40m20r5-12.pl.json	40	20	Optimal	0.23	5346	5346.00	0.00
t40m20r5-13.pl.json	40	20	Solution	30.03	4589	4393.00	4.27
t40m20r5-14.pl.json	40	20	Optimal	0.17	2243	2243.00	0.00
t40m20r5-15.pl.json	40	20	Solution	30.08	3869	3590.00	7.21
t40m20r5-16.pl.json	40	20	Optimal	0.17	4319	4319.00	0.00
t40m20r5-17.pl.json	40	20	Optimal	0.18	4866	4866.00	0.00
t40m20r5-18.pl.json	40	20	Optimal	0.39	5802	5802.00	0.00
t40m20r5-19.pl.json	40	20	Solution	30.06	4197	4072.00	2.98
t40m20r5-2.pl.json	40	20	Optimal	0.16	2634	2634.00	0.00
t40m20r5-20.pl.json	40	20	Solution	30.03	6482	6232.00	3.86
t40m20r5-3.pl.json	40	20	Optimal	0.19	4391	4391.00	0.00
t40m20r5-4.pl.json	40	20	Optimal	9.64	4610	4610.00	0.00
t40m20r5-5.pl.json	40	20	Optimal	0.17	3105	3105.00	0.00
t40m20r5-6.pl.json	40	20	Optimal	0.16	4760	4760.00	0.00
t40m20r5-7.pl.json	40	20	Optimal	0.31	1218	1218.00	0.00
t40m20r5-8.pl.json	40	20	Solution	30.05	2601	2190.00	15.80
t40m20r5-9.pl.json	40	20	Optimal	0.19	3141	3141.00	0.00
t500m100r10-1.pl.json	500	100	Solution	30.96	50084	799.00	98.40
t500m100r10-10.pl.json	500	100	Solution	30.54	43793	795.00	98.18
t500m100r10-11.pl.json	500	100	Solution	30.92	36367	801.00	97.80
t500m100r10-12.pl.json	500	100	Solution	30.64	52619	801.00	98.48
t500m100r10-13.pl.json	500	100	Solution	30.63	45030	801.00	98.22
t500m100r10-14.pl.json	500	100	Solution	30.54	40089	800.00	98.00
t500m100r10-15.pl.json	500	100	Solution	30.45	41425	801.00	98.07
t500m100r10-16.pl.json	500	100	Solution	30.65	40463	801.00	98.02
t500m100r10-17.pl.json	500	100	Solution	30.43	33209	798.00	97.60
t500m100r10-18.pl.json	500	100	Solution	30.44	41028	801.00	98.05
t500m100r10-19.pl.json	500	100	Solution	30.94	49137	801.00	98.37
t500m100r10-2.pl.json	500	100	Solution	30.54	42142	796.00	98.11
t500m100r10-20.pl.json	500	100	Solution	30.35	38167	801.00	97.90
t500m100r10-3.pl.json	500	100	Solution	30.39	37653	801.00	97.87
t500m100r10-4.pl.json	500	100	Solution	30.67	39921	798.00	98.00
t500m100r10-5.pl.json	500	100	Solution	30.47	35252	800.00	97.73
t500m100r10-6.pl.json	500	100	Solution	30.65	41172	801.00	98.05
t500m100r10-7.pl.json	500	100	Solution	30.97	41044	800.00	98.05
t500m100r10-8.pl.json	500	100	Solution	30.52	46351	800.00	98.27
t500m100r10-9.pl.json	500	100	Solution	30.51	40539	800.00	98.03
t500m100r3-1.pl.json	500	100	Solution	30.55	39303	801.00	97.96
t500m100r3-10.pl.json	500	100	Solution	30.65	42052	801.00	98.10
t500m100r3-11.pl.json	500	100	Solution	30.62	38084	794.00	97.92
t500m100r3-12.pl.json	500	100	Solution	30.70	38483	800.00	97.92
t500m100r3-13.pl.json	500	100	Solution	30.57	35447	801.00	97.74

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m100r3-14.pl.json	500	100	Solution	30.42	40571	798.00	98.03
t500m100r3-15.pl.json	500	100	Solution	30.45	38987	801.00	97.95
t500m100r3-16.pl.json	500	100	Solution	30.59	41984	798.00	98.10
t500m100r3-17.pl.json	500	100	Solution	30.48	54523	801.00	98.53
t500m100r3-18.pl.json	500	100	Solution	30.89	39919	801.00	97.99
t500m100r3-19.pl.json	500	100	Optimal	10.63	41896	41892.00	0.01
t500m100r3-2.pl.json	500	100	Optimal	10.86	41211	41207.00	0.01
t500m100r3-20.pl.json	500	100	Solution	30.78	38551	800.00	97.92
t500m100r3-3.pl.json	500	100	Solution	30.79	35516	798.00	97.75
t500m100r3-4.pl.json	500	100	Solution	30.36	32084	798.00	97.51
t500m100r3-5.pl.json	500	100	Solution	30.66	38761	801.00	97.93
t500m100r3-6.pl.json	500	100	Solution	30.52	46048	800.00	98.26
t500m100r3-7.pl.json	500	100	Solution	30.45	37680	800.00	97.88
t500m100r3-8.pl.json	500	100	Solution	30.69	40838	799.00	98.04
t500m100r3-9.pl.json	500	100	Solution	30.85	44803	801.00	98.21
t500m100r5-1.pl.json	500	100	Solution	30.49	36936	797.00	97.84
t500m100r5-10.pl.json	500	100	Solution	31.15	30332	800.00	97.36
t500m100r5-11.pl.json	500	100	Solution	30.80	37660	801.00	97.87
t500m100r5-12.pl.json	500	100	Solution	30.42	39090	799.00	97.96
t500m100r5-13.pl.json	500	100	Solution	30.39	44171	801.00	98.19
t500m100r5-14.pl.json	500	100	Solution	30.45	39568	800.00	97.98
t500m100r5-15.pl.json	500	100	Solution	30.57	38257	800.00	97.91
t500m100r5-16.pl.json	500	100	Solution	30.61	35151	798.00	97.73
t500m100r5-17.pl.json	500	100	Solution	30.72	39749	797.00	97.99
t500m100r5-18.pl.json	500	100	Solution	30.54	45868	801.00	98.25
t500m100r5-19.pl.json	500	100	Solution	30.40	46018	801.00	98.26
t500m100r5-2.pl.json	500	100	Solution	30.58	43708	800.00	98.17
t500m100r5-20.pl.json	500	100	Solution	30.82	39466	800.00	97.97
t500m100r5-3.pl.json	500	100	Solution	30.77	42468	801.00	98.11
t500m100r5-4.pl.json	500	100	Solution	30.57	33936	801.00	97.64
t500m100r5-5.pl.json	500	100	Solution	30.69	38103	795.00	97.91
t500m100r5-6.pl.json	500	100	Solution	30.62	45271	801.00	98.23
t500m100r5-7.pl.json	500	100	Solution	30.68	43542	800.00	98.16
t500m100r5-8.pl.json	500	100	Solution	30.74	38116	796.00	97.91
t500m100r5-9.pl.json	500	100	Solution	30.43	39282	801.00	97.96
t500m10r10-1.pl.json	500	10	Solution	30.06	48213	42756.00	11.32
t500m10r10-10.pl.json	500	10	Solution	30.08	35490	30745.00	13.37
t500m10r10-11.pl.json	500	10	Solution	30.10	47651	42832.00	10.11
t500m10r10-12.pl.json	500	10	Solution	30.09	43253	35908.00	16.98
t500m10r10-13.pl.json	500	10	Solution	30.28	45925	798.00	98.26
t500m10r10-14.pl.json	500	10	Solution	30.12	41016	799.00	98.05
t500m10r10-15.pl.json	500	10	Solution	30.28	38848	801.00	97.94
t500m10r10-16.pl.json	500	10	Solution	31.63	40674	801.00	98.03
t500m10r10-17.pl.json	500	10	Solution	30.09	38549	798.00	97.93

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m10r10-18.pl.json	500	10	Solution	30.26	39836	801.00	97.99
t500m10r10-19.pl.json	500	10	Solution	30.49	49367	797.00	98.39
t500m10r10-2.pl.json	500	10	Solution	31.15	38579	798.00	97.93
t500m10r10-20.pl.json	500	10	Solution	30.87	42088	801.00	98.10
t500m10r10-3.pl.json	500	10	Solution	30.31	38070	801.00	97.90
t500m10r10-4.pl.json	500	10	Solution	30.26	46184	799.00	98.27
t500m10r10-5.pl.json	500	10	Solution	31.06	47452	799.00	98.32
t500m10r10-6.pl.json	500	10	Solution	30.17	35899	799.00	97.77
t500m10r10-7.pl.json	500	10	Solution	30.64	39279	33091.00	15.75
t500m10r10-8.pl.json	500	10	Solution	30.32	45094	801.00	98.22
t500m10r10-9.pl.json	500	10	Solution	31.96	37640	801.00	97.87
t500m10r3-1.pl.json	500	10	Solution	30.16	38726	801.00	97.93
t500m10r3-10.pl.json	500	10	Solution	30.98	47861	801.00	98.33
t500m10r3-11.pl.json	500	10	Solution	31.01	38763	801.00	97.93
t500m10r3-12.pl.json	500	10	Solution	31.17	41550	800.00	98.07
t500m10r3-13.pl.json	500	10	Solution	30.56	38451	36639.00	4.71
t500m10r3-14.pl.json	500	10	Solution	30.16	39832	799.00	97.99
t500m10r3-15.pl.json	500	10	Solution	31.31	40922	801.00	98.04
t500m10r3-16.pl.json	500	10	Solution	31.25	34687	798.00	97.70
t500m10r3-17.pl.json	500	10	Solution	30.28	48591	801.00	98.35
t500m10r3-18.pl.json	500	10	Solution	32.24	38349	801.00	97.91
t500m10r3-19.pl.json	500	10	Optimal	13.39	49332	49328.00	0.01
t500m10r3-2.pl.json	500	10	Solution	30.14	41108	801.00	98.05
t500m10r3-20.pl.json	500	10	Solution	30.29	47503	801.00	98.31
t500m10r3-3.pl.json	500	10	Solution	30.21	38241	37399.00	2.20
t500m10r3-4.pl.json	500	10	Solution	30.20	48648	801.00	98.35
t500m10r3-5.pl.json	500	10	Solution	30.17	39474	800.00	97.97
t500m10r3-6.pl.json	500	10	Solution	30.56	41357	801.00	98.06
t500m10r3-7.pl.json	500	10	Solution	30.46	37420	800.00	97.86
t500m10r3-8.pl.json	500	10	Solution	30.28	43484	801.00	98.16
t500m10r3-9.pl.json	500	10	Solution	31.26	41905	799.00	98.09
t500m10r5-1.pl.json	500	10	Solution	30.33	41726	801.00	98.08
t500m10r5-10.pl.json	500	10	Solution	30.55	41224	801.00	98.06
t500m10r5-11.pl.json	500	10	Solution	31.07	45156	801.00	98.23
t500m10r5-12.pl.json	500	10	Solution	31.19	36993	801.00	97.83
t500m10r5-13.pl.json	500	10	Solution	30.81	43453	801.00	98.16
t500m10r5-14.pl.json	500	10	Solution	30.28	40022	799.00	98.00
t500m10r5-15.pl.json	500	10	Solution	30.21	39552	801.00	97.97
t500m10r5-16.pl.json	500	10	Solution	30.28	38482	801.00	97.92
t500m10r5-17.pl.json	500	10	Solution	30.13	42266	798.00	98.11
t500m10r5-18.pl.json	500	10	Solution	31.18	42898	798.00	98.14
t500m10r5-19.pl.json	500	10	Solution	30.21	41858	801.00	98.09
t500m10r5-2.pl.json	500	10	Solution	30.47	38818	800.00	97.94
t500m10r5-20.pl.json	500	10	Solution	30.13	47214	799.00	98.31

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m10r5-3.pl.json	500	10	Solution	30.66	42610	800.00	98.12
t500m10r5-4.pl.json	500	10	Solution	30.98	38232	796.00	97.92
t500m10r5-5.pl.json	500	10	Solution	32.41	35577	799.00	97.75
t500m10r5-6.pl.json	500	10	Solution	30.50	42661	801.00	98.12
t500m10r5-7.pl.json	500	10	Solution	31.06	39272	801.00	97.96
t500m10r5-8.pl.json	500	10	Solution	30.20	45732	800.00	98.25
t500m10r5-9.pl.json	500	10	Solution	30.10	40110	800.00	98.01
t500m20r10-1.pl.json	500	20	Solution	30.46	41844	801.00	98.09
t500m20r10-10.pl.json	500	20	Solution	30.25	38682	798.00	97.94
t500m20r10-11.pl.json	500	20	Solution	30.30	38851	799.00	97.94
t500m20r10-12.pl.json	500	20	Solution	30.60	40997	801.00	98.05
t500m20r10-13.pl.json	500	20	Solution	30.80	42326	800.00	98.11
t500m20r10-14.pl.json	500	20	Solution	30.37	40102	798.00	98.01
t500m20r10-15.pl.json	500	20	Solution	30.37	37261	801.00	97.85
t500m20r10-16.pl.json	500	20	Solution	30.31	45059	799.00	98.23
t500m20r10-17.pl.json	500	20	Solution	30.47	40322	801.00	98.01
t500m20r10-18.pl.json	500	20	Solution	30.42	41699	801.00	98.08
t500m20r10-19.pl.json	500	20	Solution	30.41	42802	800.00	98.13
t500m20r10-2.pl.json	500	20	Solution	30.44	46938	801.00	98.29
t500m20r10-20.pl.json	500	20	Solution	30.63	41229	801.00	98.06
t500m20r10-3.pl.json	500	20	Solution	31.61	42399	797.00	98.12
t500m20r10-4.pl.json	500	20	Solution	30.25	35833	801.00	97.76
t500m20r10-5.pl.json	500	20	Solution	31.95	47409	799.00	98.31
t500m20r10-6.pl.json	500	20	Solution	30.28	38270	800.00	97.91
t500m20r10-7.pl.json	500	20	Solution	30.43	33671	800.00	97.62
t500m20r10-8.pl.json	500	20	Solution	30.29	42768	801.00	98.13
t500m20r10-9.pl.json	500	20	Solution	31.70	42752	800.00	98.13
t500m20r3-1.pl.json	500	20	Solution	30.60	37589	800.00	97.87
t500m20r3-10.pl.json	500	20	Solution	30.36	43028	799.00	98.14
t500m20r3-11.pl.json	500	20	Solution	30.25	38845	798.00	97.95
t500m20r3-12.pl.json	500	20	Optimal	20.86	40309	40305.00	0.01
t500m20r3-13.pl.json	500	20	Solution	30.28	33674	801.00	97.62
t500m20r3-14.pl.json	500	20	Solution	31.31	35053	801.00	97.71
t500m20r3-15.pl.json	500	20	Solution	30.48	37738	798.00	97.89
t500m20r3-16.pl.json	500	20	Optimal	10.02	42848	42844.00	0.01
t500m20r3-17.pl.json	500	20	Solution	30.45	39712	801.00	97.98
t500m20r3-18.pl.json	500	20	Optimal	26.11	43126	43122.00	0.01
t500m20r3-19.pl.json	500	20	Solution	30.60	38470	801.00	97.92
t500m20r3-2.pl.json	500	20	Solution	31.20	42503	801.00	98.12
t500m20r3-20.pl.json	500	20	Solution	30.56	45671	796.00	98.26
t500m20r3-3.pl.json	500	20	Solution	31.44	31953	801.00	97.49
t500m20r3-4.pl.json	500	20	Optimal	19.30	43640	43636.00	0.01
t500m20r3-5.pl.json	500	20	Solution	31.71	48450	801.00	98.35
t500m20r3-6.pl.json	500	20	Solution	30.21	35374	799.00	97.74

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m20r3-7.pl.json	500	20	Solution	31.64	45964	796.00	98.27
t500m20r3-8.pl.json	500	20	Solution	31.19	44328	800.00	98.20
t500m20r3-9.pl.json	500	20	Solution	30.76	41079	801.00	98.05
t500m20r5-1.pl.json	500	20	Solution	30.82	36856	801.00	97.83
t500m20r5-10.pl.json	500	20	Solution	34.35	45187	801.00	98.23
t500m20r5-11.pl.json	500	20	Solution	30.26	37707	801.00	97.88
t500m20r5-12.pl.json	500	20	Solution	30.38	37405	800.00	97.86
t500m20r5-13.pl.json	500	20	Solution	31.71	42913	799.00	98.14
t500m20r5-14.pl.json	500	20	Solution	30.23	47228	801.00	98.30
t500m20r5-15.pl.json	500	20	Solution	30.47	40611	801.00	98.03
t500m20r5-16.pl.json	500	20	Solution	30.25	38970	796.00	97.96
t500m20r5-17.pl.json	500	20	Solution	31.62	42158	799.00	98.10
t500m20r5-18.pl.json	500	20	Solution	30.57	43669	800.00	98.17
t500m20r5-19.pl.json	500	20	Solution	32.15	41883	800.00	98.09
t500m20r5-2.pl.json	500	20	Solution	30.51	42467	800.00	98.12
t500m20r5-20.pl.json	500	20	Solution	31.79	37677	801.00	97.87
t500m20r5-3.pl.json	500	20	Solution	31.76	41645	801.00	98.08
t500m20r5-4.pl.json	500	20	Solution	30.15	43010	801.00	98.14
t500m20r5-5.pl.json	500	20	Solution	31.17	43158	801.00	98.14
t500m20r5-6.pl.json	500	20	Solution	32.51	42199	801.00	98.10
t500m20r5-7.pl.json	500	20	Solution	32.83	39535	801.00	97.97
t500m20r5-8.pl.json	500	20	Solution	30.30	44676	801.00	98.21
t500m20r5-9.pl.json	500	20	Solution	31.25	41543	801.00	98.07
t500m50r10-1.pl.json	500	50	Solution	30.78	44568	800.00	98.20
t500m50r10-10.pl.json	500	50	Solution	30.55	41613	800.00	98.08
t500m50r10-11.pl.json	500	50	Solution	30.90	46894	800.00	98.29
t500m50r10-12.pl.json	500	50	Solution	30.37	37026	800.00	97.84
t500m50r10-13.pl.json	500	50	Solution	30.38	34634	799.00	97.69
t500m50r10-14.pl.json	500	50	Solution	30.43	45916	801.00	98.26
t500m50r10-15.pl.json	500	50	Solution	31.36	39306	801.00	97.96
t500m50r10-16.pl.json	500	50	Solution	30.25	36757	801.00	97.82
t500m50r10-17.pl.json	500	50	Solution	31.08	33180	800.00	97.59
t500m50r10-18.pl.json	500	50	Solution	30.64	47233	800.00	98.31
t500m50r10-19.pl.json	500	50	Solution	30.48	42433	801.00	98.11
t500m50r10-2.pl.json	500	50	Solution	30.60	43789	795.00	98.18
t500m50r10-20.pl.json	500	50	Solution	30.76	40950	799.00	98.05
t500m50r10-3.pl.json	500	50	Solution	31.76	42014	801.00	98.09
t500m50r10-4.pl.json	500	50	Solution	30.63	42966	801.00	98.14
t500m50r10-5.pl.json	500	50	Solution	32.16	37220	801.00	97.85
t500m50r10-6.pl.json	500	50	Solution	30.47	33806	799.00	97.64
t500m50r10-7.pl.json	500	50	Solution	30.57	35308	801.00	97.73
t500m50r10-8.pl.json	500	50	Solution	30.57	45479	801.00	98.24
t500m50r10-9.pl.json	500	50	Solution	31.13	39057	801.00	97.95
t500m50r3-1.pl.json	500	50	Solution	30.75	43686	799.00	98.17

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m50r3-10.pl.json	500	50	Solution	30.38	43311	801.00	98.15
t500m50r3-11.pl.json	500	50	Solution	30.52	40856	801.00	98.04
t500m50r3-12.pl.json	500	50	Solution	31.12	38574	800.00	97.93
t500m50r3-13.pl.json	500	50	Solution	30.39	40371	801.00	98.02
t500m50r3-14.pl.json	500	50	Solution	30.71	33849	801.00	97.63
t500m50r3-15.pl.json	500	50	Solution	30.55	39980	801.00	98.00
t500m50r3-16.pl.json	500	50	Solution	31.08	43812	800.00	98.17
t500m50r3-17.pl.json	500	50	Solution	30.64	37519	800.00	97.87
t500m50r3-18.pl.json	500	50	Solution	30.30	42694	800.00	98.13
t500m50r3-19.pl.json	500	50	Solution	30.27	35437	801.00	97.74
t500m50r3-2.pl.json	500	50	Solution	31.61	39303	801.00	97.96
t500m50r3-20.pl.json	500	50	Solution	30.62	42019	801.00	98.09
t500m50r3-3.pl.json	500	50	Solution	30.84	45798	799.00	98.26
t500m50r3-4.pl.json	500	50	Solution	30.67	43883	795.00	98.19
t500m50r3-5.pl.json	500	50	Solution	30.72	45514	801.00	98.24
t500m50r3-6.pl.json	500	50	Solution	31.17	39292	801.00	97.96
t500m50r3-7.pl.json	500	50	Solution	31.28	42541	801.00	98.12
t500m50r3-8.pl.json	500	50	Optimal	14.11	46948	46944.00	0.01
t500m50r3-9.pl.json	500	50	Solution	30.93	46088	798.00	98.27
t500m50r5-1.pl.json	500	50	Solution	30.33	43603	798.00	98.17
t500m50r5-10.pl.json	500	50	Solution	31.41	43308	799.00	98.16
t500m50r5-11.pl.json	500	50	Solution	31.16	45756	799.00	98.25
t500m50r5-12.pl.json	500	50	Solution	30.53	42655	798.00	98.13
t500m50r5-13.pl.json	500	50	Solution	30.57	39240	801.00	97.96
t500m50r5-14.pl.json	500	50	Solution	30.66	41327	800.00	98.06
t500m50r5-15.pl.json	500	50	Solution	30.36	46276	801.00	98.27
t500m50r5-16.pl.json	500	50	Solution	31.01	43409	801.00	98.15
t500m50r5-17.pl.json	500	50	Solution	30.82	37044	799.00	97.84
t500m50r5-18.pl.json	500	50	Solution	31.01	36830	800.00	97.83
t500m50r5-19.pl.json	500	50	Solution	30.65	39841	798.00	98.00
t500m50r5-2.pl.json	500	50	Solution	31.27	42587	801.00	98.12
t500m50r5-20.pl.json	500	50	Solution	31.02	43943	801.00	98.18
t500m50r5-3.pl.json	500	50	Solution	30.34	38800	800.00	97.94
t500m50r5-4.pl.json	500	50	Solution	30.81	34378	801.00	97.67
t500m50r5-5.pl.json	500	50	Solution	30.55	35109	801.00	97.72
t500m50r5-6.pl.json	500	50	Solution	30.66	45567	801.00	98.24
t500m50r5-7.pl.json	500	50	Solution	30.55	45340	797.00	98.24
t500m50r5-8.pl.json	500	50	Solution	30.41	34311	800.00	97.67
t500m50r5-9.pl.json	500	50	Solution	31.20	32817	797.00	97.57
t50m10r10-1.pl.json	50	10	Solution	30.11	6499	5840.00	10.14
t50m10r10-10.pl.json	50	10	Solution	30.27	3396	3172.00	6.60
t50m10r10-11.pl.json	50	10	Solution	30.40	3398	3141.00	7.56
t50m10r10-12.pl.json	50	10	Solution	30.54	7550	6544.00	13.32
t50m10r10-13.pl.json	50	10	Solution	30.55	5484	5191.00	5.34

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t50m10r10-14.pl.json	50	10	Solution	30.27	4666	3431.00	26.47
t50m10r10-15.pl.json	50	10	Solution	30.91	6640	5903.00	11.10
t50m10r10-16.pl.json	50	10	Solution	30.38	4914	4515.00	8.12
t50m10r10-17.pl.json	50	10	Optimal	8.07	2252	2252.00	0.00
t50m10r10-18.pl.json	50	10	Solution	30.74	4034	3841.00	4.78
t50m10r10-19.pl.json	50	10	Solution	30.42	4873	4532.00	7.00
t50m10r10-2.pl.json	50	10	Solution	30.36	4148	3646.00	12.10
t50m10r10-20.pl.json	50	10	Optimal	6.15	3158	3158.00	0.00
t50m10r10-3.pl.json	50	10	Solution	30.40	4334	4190.00	3.32
t50m10r10-4.pl.json	50	10	Solution	30.42	4259	3715.00	12.77
t50m10r10-5.pl.json	50	10	Solution	30.75	2211	2199.00	0.54
t50m10r10-6.pl.json	50	10	Solution	30.32	5752	5457.00	5.13
t50m10r10-7.pl.json	50	10	Solution	30.47	3239	3125.00	3.52
t50m10r10-8.pl.json	50	10	Optimal	10.44	2624	2624.00	0.00
t50m10r10-9.pl.json	50	10	Solution	30.28	5109	5015.00	1.84
t50m10r3-1.pl.json	50	10	Optimal	1.52	7067	7067.00	0.00
t50m10r3-10.pl.json	50	10	Optimal	1.64	4504	4504.00	0.00
t50m10r3-11.pl.json	50	10	Solution	30.38	3856	3811.00	1.17
t50m10r3-12.pl.json	50	10	Optimal	2.46	3063	3063.00	0.00
t50m10r3-13.pl.json	50	10	Optimal	1.56	5368	5368.00	0.00
t50m10r3-14.pl.json	50	10	Optimal	1.56	5759	5759.00	0.00
t50m10r3-15.pl.json	50	10	Optimal	4.99	6360	6360.00	0.00
t50m10r3-16.pl.json	50	10	Optimal	1.98	7616	7616.00	0.00
t50m10r3-17.pl.json	50	10	Solution	30.18	5429	5233.00	3.61
t50m10r3-18.pl.json	50	10	Optimal	1.79	5186	5186.00	0.00
t50m10r3-19.pl.json	50	10	Optimal	2.82	4197	4197.00	0.00
t50m10r3-2.pl.json	50	10	Optimal	1.73	5680	5680.00	0.00
t50m10r3-20.pl.json	50	10	Optimal	2.67	7792	7792.00	0.00
t50m10r3-3.pl.json	50	10	Optimal	5.77	3752	3752.00	0.00
t50m10r3-4.pl.json	50	10	Optimal	3.35	4942	4942.00	0.00
t50m10r3-5.pl.json	50	10	Optimal	1.80	6159	6159.00	0.00
t50m10r3-6.pl.json	50	10	Optimal	4.39	3804	3804.00	0.00
t50m10r3-7.pl.json	50	10	Optimal	2.96	6186	6186.00	0.00
t50m10r3-8.pl.json	50	10	Optimal	2.17	5142	5142.00	0.00
t50m10r3-9.pl.json	50	10	Solution	30.43	7279	7191.00	1.21
t50m10r5-1.pl.json	50	10	Optimal	1.94	5397	5397.00	0.00
t50m10r5-10.pl.json	50	10	Optimal	1.81	4926	4926.00	0.00
t50m10r5-11.pl.json	50	10	Optimal	3.35	3620	3620.00	0.00
t50m10r5-12.pl.json	50	10	Optimal	5.13	5183	5183.00	0.00
t50m10r5-13.pl.json	50	10	Solution	30.36	5716	5394.00	5.63
t50m10r5-14.pl.json	50	10	Optimal	3.28	2828	2828.00	0.00
t50m10r5-15.pl.json	50	10	Solution	30.43	6385	6283.00	1.60
t50m10r5-16.pl.json	50	10	Solution	30.23	4548	3970.00	12.71
t50m10r5-17.pl.json	50	10	Optimal	2.89	5129	5129.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t50m10r5-18.pl.json	50	10	Solution	30.55	5831	5303.00	9.06
t50m10r5-19.pl.json	50	10	Solution	30.37	5552	5213.00	6.11
t50m10r5-2.pl.json	50	10	Optimal	1.70	5153	5153.00	0.00
t50m10r5-20.pl.json	50	10	Solution	30.32	3900	3686.00	5.49
t50m10r5-3.pl.json	50	10	Solution	30.25	4708	4667.00	0.87
t50m10r5-4.pl.json	50	10	Solution	30.36	5551	4986.00	10.18
t50m10r5-5.pl.json	50	10	Optimal	3.36	7451	7451.00	0.00
t50m10r5-6.pl.json	50	10	Optimal	2.76	3781	3781.00	0.00
t50m10r5-7.pl.json	50	10	Solution	30.10	3323	3164.00	4.78
t50m10r5-8.pl.json	50	10	Solution	30.32	5559	4986.00	10.31
t50m10r5-9.pl.json	50	10	Solution	30.21	6385	6082.00	4.75
t50m20r10-1.pl.json	50	20	Solution	30.30	5211	4457.00	14.47
t50m20r10-10.pl.json	50	20	Optimal	3.71	7934	7934.00	0.00
t50m20r10-11.pl.json	50	20	Solution	30.84	5509	5264.00	4.45
t50m20r10-12.pl.json	50	20	Solution	30.38	5023	4256.00	15.27
t50m20r10-13.pl.json	50	20	Optimal	3.51	4143	4143.00	0.00
t50m20r10-14.pl.json	50	20	Optimal	3.25	6048	6048.00	0.00
t50m20r10-15.pl.json	50	20	Solution	30.15	5992	5301.00	11.53
t50m20r10-16.pl.json	50	20	Optimal	5.39	5032	5032.00	0.00
t50m20r10-17.pl.json	50	20	Optimal	3.01	4488	4488.00	0.00
t50m20r10-18.pl.json	50	20	Solution	30.20	4848	4599.00	5.14
t50m20r10-19.pl.json	50	20	Solution	30.38	5430	4555.00	16.11
t50m20r10-2.pl.json	50	20	Solution	30.80	6192	5348.00	13.63
t50m20r10-20.pl.json	50	20	Solution	30.20	6271	5680.00	9.42
t50m20r10-3.pl.json	50	20	Solution	30.90	6582	6278.00	4.62
t50m20r10-4.pl.json	50	20	Solution	31.22	5686	5160.00	9.25
t50m20r10-5.pl.json	50	20	Optimal	4.66	3301	3301.00	0.00
t50m20r10-6.pl.json	50	20	Solution	30.44	4425	795.00	82.03
t50m20r10-7.pl.json	50	20	Optimal	5.62	3519	3519.00	0.00
t50m20r10-8.pl.json	50	20	Solution	30.31	4630	4569.00	1.32
t50m20r10-9.pl.json	50	20	Solution	30.25	5869	5303.00	9.64
t50m20r3-1.pl.json	50	20	Optimal	2.72	3869	3869.00	0.00
t50m20r3-10.pl.json	50	20	Optimal	2.86	3982	3982.00	0.00
t50m20r3-11.pl.json	50	20	Optimal	2.65	4144	4144.00	0.00
t50m20r3-12.pl.json	50	20	Optimal	3.17	2791	2791.00	0.00
t50m20r3-13.pl.json	50	20	Optimal	6.37	6449	6449.00	0.00
t50m20r3-14.pl.json	50	20	Optimal	2.91	4933	4933.00	0.00
t50m20r3-15.pl.json	50	20	Solution	30.45	2436	2218.00	8.95
t50m20r3-16.pl.json	50	20	Optimal	2.72	5872	5872.00	0.00
t50m20r3-17.pl.json	50	20	Optimal	6.52	6880	6880.00	0.00
t50m20r3-18.pl.json	50	20	Optimal	3.21	2811	2811.00	0.00
t50m20r3-19.pl.json	50	20	Optimal	3.25	3465	3465.00	0.00
t50m20r3-2.pl.json	50	20	Optimal	3.02	5570	5570.00	0.00
t50m20r3-20.pl.json	50	20	Optimal	2.42	6364	6364.00	0.00

Table 7.1: Results for Test Scheduling Problems (CPO) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t50m20r3-3.pl.json	50	20	Optimal	2.73	3081	3081.00	0.00
t50m20r3-4.pl.json	50	20	Optimal	2.54	3505	3505.00	0.00
t50m20r3-5.pl.json	50	20	Optimal	2.82	2228	2228.00	0.00
t50m20r3-6.pl.json	50	20	Optimal	4.73	5713	5713.00	0.00
t50m20r3-7.pl.json	50	20	Optimal	3.34	3173	3173.00	0.00
t50m20r3-8.pl.json	50	20	Solution	30.22	3908	3772.00	3.48
t50m20r3-9.pl.json	50	20	Optimal	3.23	4661	4661.00	0.00
t50m20r5-1.pl.json	50	20	Solution	30.23	6273	5304.00	15.45
t50m20r5-10.pl.json	50	20	Optimal	3.06	2328	2328.00	0.00
t50m20r5-11.pl.json	50	20	Optimal	3.05	6403	6403.00	0.00
t50m20r5-12.pl.json	50	20	Optimal	2.81	4281	4281.00	0.00
t50m20r5-13.pl.json	50	20	Optimal	3.17	5754	5754.00	0.00
t50m20r5-14.pl.json	50	20	Solution	30.47	6639	5359.00	19.28
t50m20r5-15.pl.json	50	20	Optimal	2.69	3472	3472.00	0.00
t50m20r5-16.pl.json	50	20	Solution	30.29	5934	5042.00	15.03
t50m20r5-17.pl.json	50	20	Optimal	2.73	4745	4745.00	0.00
t50m20r5-18.pl.json	50	20	Optimal	6.48	3147	3147.00	0.00
t50m20r5-19.pl.json	50	20	Optimal	9.46	5960	5960.00	0.00
t50m20r5-2.pl.json	50	20	Solution	30.38	5547	5417.00	2.34
t50m20r5-20.pl.json	50	20	Optimal	2.75	3913	3913.00	0.00
t50m20r5-3.pl.json	50	20	Solution	30.27	5598	4754.00	15.08
t50m20r5-4.pl.json	50	20	Solution	30.39	5367	4465.00	16.81
t50m20r5-5.pl.json	50	20	Optimal	7.45	3648	3648.00	0.00
t50m20r5-6.pl.json	50	20	Optimal	2.76	5449	5449.00	0.00
t50m20r5-7.pl.json	50	20	Solution	30.13	4127	3794.00	8.07
t50m20r5-8.pl.json	50	20	Solution	30.32	5003	4535.00	9.35
t50m20r5-9.pl.json	50	20	Optimal	3.06	4022	4022.00	0.00

7.2 Results for CPSat

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m10r10-1.pl.json	100	10	Solution	30.04	10491	9055.00	13.69
t100m10r10-10.pl.json	100	10	Solution	30.04	9599	8369.00	12.81
t100m10r10-11.pl.json	100	10	Solution	30.04	5336	5100.00	4.42
t100m10r10-12.pl.json	100	10	Solution	30.04	6564	5613.00	14.49
t100m10r10-13.pl.json	100	10	Solution	30.05	6831	6786.00	0.66
t100m10r10-14.pl.json	100	10	Solution	30.03	5775	5257.00	8.97

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m10r10-15.pl.json	100	10	Solution	30.02	6105	5012.00	17.90
t100m10r10-16.pl.json	100	10	Solution	30.04	12563	11589.00	7.75
t100m10r10-17.pl.json	100	10	Solution	30.05	8954	8114.00	9.38
t100m10r10-18.pl.json	100	10	Solution	30.05	10180	9304.00	8.61
t100m10r10-19.pl.json	100	10	Solution	30.03	9812	8514.00	13.23
t100m10r10-2.pl.json	100	10	Solution	30.02	11593	9807.00	15.41
t100m10r10-20.pl.json	100	10	Solution	30.04	12342	10686.00	13.42
t100m10r10-3.pl.json	100	10	Solution	30.03	6884	6379.00	7.34
t100m10r10-4.pl.json	100	10	Solution	30.03	11041	9111.00	17.48
t100m10r10-5.pl.json	100	10	Solution	30.04	12241	11823.00	3.41
t100m10r10-6.pl.json	100	10	Solution	30.04	11906	10914.00	8.33
t100m10r10-7.pl.json	100	10	Solution	30.05	6435	5732.00	10.92
t100m10r10-8.pl.json	100	10	Solution	30.03	11070	10010.00	9.58
t100m10r10-9.pl.json	100	10	Solution	30.03	9878	7991.00	19.10
t100m10r3-1.pl.json	100	10	Optimal	12.19	8711	8711.00	0.00
t100m10r3-10.pl.json	100	10	Optimal	15.43	8958	8958.00	0.00
t100m10r3-11.pl.json	100	10	Optimal	3.27	9560	9560.00	0.00
t100m10r3-12.pl.json	100	10	Optimal	2.92	7892	7892.00	0.00
t100m10r3-13.pl.json	100	10	Optimal	19.27	10078	10078.00	0.00
t100m10r3-14.pl.json	100	10	Optimal	18.02	8681	8681.00	0.00
t100m10r3-15.pl.json	100	10	Optimal	2.13	8810	8810.00	0.00
t100m10r3-16.pl.json	100	10	Optimal	10.48	11182	11182.00	0.00
t100m10r3-17.pl.json	100	10	Optimal	10.25	7534	7534.00	0.00
t100m10r3-18.pl.json	100	10	Solution	30.05	10376	9934.00	4.26
t100m10r3-19.pl.json	100	10	Solution	30.04	7706	6970.00	9.55
t100m10r3-2.pl.json	100	10	Optimal	1.65	7082	7082.00	0.00
t100m10r3-20.pl.json	100	10	Optimal	0.47	9025	9025.00	0.00
t100m10r3-3.pl.json	100	10	Optimal	3.03	10054	10054.00	0.00
t100m10r3-4.pl.json	100	10	Optimal	1.74	13122	13122.00	0.00
t100m10r3-5.pl.json	100	10	Optimal	13.52	7545	7545.00	0.00
t100m10r3-6.pl.json	100	10	Optimal	14.51	7840	7840.00	0.00
t100m10r3-7.pl.json	100	10	Optimal	3.63	11010	11010.00	0.00
t100m10r3-8.pl.json	100	10	Optimal	5.99	9112	9112.00	0.00
t100m10r3-9.pl.json	100	10	Optimal	11.16	8532	8532.00	0.00
t100m10r5-1.pl.json	100	10	Solution	30.04	7304	7300.00	0.05
t100m10r5-10.pl.json	100	10	Optimal	12.84	6972	6972.00	0.00
t100m10r5-11.pl.json	100	10	Solution	30.04	9098	8568.00	5.83
t100m10r5-12.pl.json	100	10	Optimal	5.79	6538	6538.00	0.00
t100m10r5-13.pl.json	100	10	Optimal	18.18	8972	8972.00	0.00
t100m10r5-14.pl.json	100	10	Solution	30.03	10539	10347.00	1.82
t100m10r5-15.pl.json	100	10	Solution	30.03	5762	5647.00	2.00
t100m10r5-16.pl.json	100	10	Solution	30.04	7019	6207.00	11.57
t100m10r5-17.pl.json	100	10	Optimal	4.08	6728	6728.00	0.00
t100m10r5-18.pl.json	100	10	Solution	30.04	9019	8811.00	2.31

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m10r5-19.pl.json	100	10	Optimal	13.99	8885	8885.00	0.00
t100m10r5-2.pl.json	100	10	Optimal	8.51	9010	9010.00	0.00
t100m10r5-20.pl.json	100	10	Optimal	12.69	7022	7022.00	0.00
t100m10r5-3.pl.json	100	10	Solution	30.04	8857	8820.00	0.42
t100m10r5-4.pl.json	100	10	Optimal	22.41	10753	10753.00	0.00
t100m10r5-5.pl.json	100	10	Optimal	11.65	6608	6608.00	0.00
t100m10r5-6.pl.json	100	10	Solution	30.04	9452	8456.00	10.54
t100m10r5-7.pl.json	100	10	Solution	30.04	8186	7664.00	6.38
t100m10r5-8.pl.json	100	10	Solution	30.03	11383	10079.00	11.46
t100m10r5-9.pl.json	100	10	Solution	30.03	11649	10683.00	8.29
t100m20r10-1.pl.json	100	20	Solution	30.06	12643	12180.00	3.66
t100m20r10-10.pl.json	100	20	Solution	30.05	12653	10953.00	13.44
t100m20r10-11.pl.json	100	20	Solution	30.06	8724	7289.00	16.45
t100m20r10-12.pl.json	100	20	Solution	30.05	7404	6774.00	8.51
t100m20r10-13.pl.json	100	20	Solution	30.05	9695	9229.00	4.81
t100m20r10-14.pl.json	100	20	Solution	30.05	10027	8652.00	13.71
t100m20r10-15.pl.json	100	20	Solution	30.05	6544	5362.00	18.06
t100m20r10-16.pl.json	100	20	Solution	30.05	9264	8343.00	9.94
t100m20r10-17.pl.json	100	20	Solution	30.07	8691	7381.00	15.07
t100m20r10-18.pl.json	100	20	Optimal	15.69	4843	4843.00	0.00
t100m20r10-19.pl.json	100	20	Solution	30.05	12320	11752.00	4.61
t100m20r10-2.pl.json	100	20	Solution	30.05	7760	6890.00	11.21
t100m20r10-20.pl.json	100	20	Solution	30.03	10030	8562.00	14.64
t100m20r10-3.pl.json	100	20	Solution	30.06	7133	6295.00	11.75
t100m20r10-4.pl.json	100	20	Solution	30.06	9671	9052.00	6.40
t100m20r10-5.pl.json	100	20	Solution	30.04	9230	8459.00	8.35
t100m20r10-6.pl.json	100	20	Solution	30.06	8781	7619.00	13.23
t100m20r10-7.pl.json	100	20	Solution	30.05	11318	9767.00	13.70
t100m20r10-8.pl.json	100	20	Solution	30.06	7852	7041.00	10.33
t100m20r10-9.pl.json	100	20	Solution	30.05	10856	10019.00	7.71
t100m20r3-1.pl.json	100	20	Optimal	9.73	6585	6585.00	0.00
t100m20r3-10.pl.json	100	20	Optimal	4.77	8535	8535.00	0.00
t100m20r3-11.pl.json	100	20	Optimal	13.99	9084	9084.00	0.00
t100m20r3-12.pl.json	100	20	Optimal	2.36	9066	9066.00	0.00
t100m20r3-13.pl.json	100	20	Solution	30.07	11429	9974.00	12.73
t100m20r3-14.pl.json	100	20	Optimal	8.11	8786	8786.00	0.00
t100m20r3-15.pl.json	100	20	Optimal	12.26	10205	10205.00	0.00
t100m20r3-16.pl.json	100	20	Optimal	10.67	8856	8856.00	0.00
t100m20r3-17.pl.json	100	20	Optimal	10.75	5451	5451.00	0.00
t100m20r3-18.pl.json	100	20	Optimal	11.28	8752	8752.00	0.00
t100m20r3-19.pl.json	100	20	Solution	30.04	8909	8860.00	0.55
t100m20r3-2.pl.json	100	20	Optimal	13.78	8498	8498.00	0.00
t100m20r3-20.pl.json	100	20	Optimal	3.73	7880	7880.00	0.00
t100m20r3-3.pl.json	100	20	Solution	30.04	12192	11987.00	1.68

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m20r3-4.pl.json	100	20	Optimal	18.10	12258	12258.00	0.00
t100m20r3-5.pl.json	100	20	Optimal	7.98	11932	11932.00	0.00
t100m20r3-6.pl.json	100	20	Optimal	10.86	8531	8531.00	0.00
t100m20r3-7.pl.json	100	20	Optimal	7.63	6512	6512.00	0.00
t100m20r3-8.pl.json	100	20	Optimal	18.30	10690	10690.00	0.00
t100m20r3-9.pl.json	100	20	Optimal	2.31	8255	8255.00	0.00
t100m20r5-1.pl.json	100	20	Optimal	12.04	9098	9098.00	0.00
t100m20r5-10.pl.json	100	20	Solution	30.05	8340	7964.00	4.51
t100m20r5-11.pl.json	100	20	Solution	30.05	6828	5564.00	18.51
t100m20r5-12.pl.json	100	20	Solution	30.04	8722	8704.00	0.21
t100m20r5-13.pl.json	100	20	Optimal	16.31	8880	8880.00	0.00
t100m20r5-14.pl.json	100	20	Solution	30.06	10621	9727.00	8.42
t100m20r5-15.pl.json	100	20	Optimal	18.85	8953	8953.00	0.00
t100m20r5-16.pl.json	100	20	Solution	30.05	8020	7594.00	5.31
t100m20r5-17.pl.json	100	20	Solution	30.05	5685	5524.00	2.83
t100m20r5-18.pl.json	100	20	Solution	30.03	6637	6617.00	0.30
t100m20r5-19.pl.json	100	20	Optimal	22.81	9461	9461.00	0.00
t100m20r5-2.pl.json	100	20	Optimal	13.63	9566	9566.00	0.00
t100m20r5-20.pl.json	100	20	Solution	30.03	11569	10228.00	11.59
t100m20r5-3.pl.json	100	20	Solution	30.06	9470	9366.00	1.10
t100m20r5-4.pl.json	100	20	Solution	30.04	14465	12456.00	13.89
t100m20r5-5.pl.json	100	20	Optimal	12.10	8585	8585.00	0.00
t100m20r5-6.pl.json	100	20	Solution	30.05	7528	6539.00	13.14
t100m20r5-7.pl.json	100	20	Solution	30.05	11413	10099.00	11.51
t100m20r5-8.pl.json	100	20	Optimal	17.27	5812	5812.00	0.00
t100m20r5-9.pl.json	100	20	Solution	30.06	6657	6496.00	2.42
t100m50r10-1.pl.json	100	50	Solution	30.10	7299	6941.00	4.90
t100m50r10-10.pl.json	100	50	Solution	30.08	5201	5108.00	1.79
t100m50r10-11.pl.json	100	50	Solution	30.11	4970	4782.00	3.78
t100m50r10-12.pl.json	100	50	Solution	30.12	9335	9122.00	2.28
t100m50r10-13.pl.json	100	50	Solution	30.11	9759	8828.00	9.54
t100m50r10-14.pl.json	100	50	Solution	30.08	10724	8290.00	22.70
t100m50r10-15.pl.json	100	50	Solution	30.08	8640	7804.00	9.68
t100m50r10-16.pl.json	100	50	Solution	30.12	14211	12381.00	12.88
t100m50r10-17.pl.json	100	50	Solution	30.10	9826	9151.00	6.87
t100m50r10-18.pl.json	100	50	Solution	30.09	7384	7120.00	3.58
t100m50r10-19.pl.json	100	50	Solution	30.07	8559	8059.00	5.84
t100m50r10-2.pl.json	100	50	Solution	30.12	7968	7568.00	5.02
t100m50r10-20.pl.json	100	50	Solution	30.11	8421	7939.00	5.72
t100m50r10-3.pl.json	100	50	Optimal	2.98	6937	6937.00	0.00
t100m50r10-4.pl.json	100	50	Solution	30.10	10208	8525.00	16.49
t100m50r10-5.pl.json	100	50	Optimal	18.08	9859	9859.00	0.00
t100m50r10-6.pl.json	100	50	Solution	30.09	7715	6837.00	11.38
t100m50r10-7.pl.json	100	50	Solution	30.10	9691	9542.00	1.54

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t100m50r10-8.pl.json	100	50	Solution	30.13	10719	9176.00	14.39
t100m50r10-9.pl.json	100	50	Solution	30.08	10453	9375.00	10.31
t100m50r3-1.pl.json	100	50	Optimal	10.47	9937	9937.00	0.00
t100m50r3-10.pl.json	100	50	Solution	30.12	8957	8877.00	0.89
t100m50r3-11.pl.json	100	50	Optimal	16.48	6141	6141.00	0.00
t100m50r3-12.pl.json	100	50	Optimal	3.37	6473	6473.00	0.00
t100m50r3-13.pl.json	100	50	Optimal	7.08	8653	8653.00	0.00
t100m50r3-14.pl.json	100	50	Solution	30.07	13039	12796.00	1.86
t100m50r3-15.pl.json	100	50	Solution	30.13	9271	9056.00	2.32
t100m50r3-16.pl.json	100	50	Optimal	15.74	8680	8680.00	0.00
t100m50r3-17.pl.json	100	50	Optimal	5.79	8197	8197.00	0.00
t100m50r3-18.pl.json	100	50	Optimal	6.21	9318	9318.00	0.00
t100m50r3-19.pl.json	100	50	Optimal	4.24	12265	12265.00	0.00
t100m50r3-2.pl.json	100	50	Optimal	25.96	11030	11030.00	0.00
t100m50r3-20.pl.json	100	50	Optimal	2.53	7662	7662.00	0.00
t100m50r3-3.pl.json	100	50	Optimal	2.34	5348	5348.00	0.00
t100m50r3-4.pl.json	100	50	Optimal	14.63	7800	7800.00	0.00
t100m50r3-5.pl.json	100	50	Optimal	13.56	4207	4207.00	0.00
t100m50r3-6.pl.json	100	50	Solution	30.08	10674	10596.00	0.73
t100m50r3-7.pl.json	100	50	Optimal	3.88	7826	7826.00	0.00
t100m50r3-8.pl.json	100	50	Optimal	14.67	7865	7865.00	0.00
t100m50r3-9.pl.json	100	50	Optimal	3.79	7891	7891.00	0.00
t100m50r5-1.pl.json	100	50	Solution	30.07	8016	7926.00	1.12
t100m50r5-10.pl.json	100	50	Solution	30.08	7299	6521.00	10.66
t100m50r5-11.pl.json	100	50	Optimal	18.72	9417	9417.00	0.00
t100m50r5-12.pl.json	100	50	Optimal	4.77	8824	8824.00	0.00
t100m50r5-13.pl.json	100	50	Solution	30.12	10473	9115.00	12.97
t100m50r5-14.pl.json	100	50	Solution	30.08	7503	7134.00	4.92
t100m50r5-15.pl.json	100	50	Solution	30.10	10141	9853.00	2.84
t100m50r5-16.pl.json	100	50	Optimal	9.40	6481	6481.00	0.00
t100m50r5-17.pl.json	100	50	Optimal	5.97	6129	6129.00	0.00
t100m50r5-18.pl.json	100	50	Solution	30.08	9100	8337.00	8.38
t100m50r5-19.pl.json	100	50	Solution	30.09	6762	6356.00	6.00
t100m50r5-2.pl.json	100	50	Optimal	4.94	6651	6651.00	0.00
t100m50r5-20.pl.json	100	50	Solution	30.08	6894	6667.00	3.29
t100m50r5-3.pl.json	100	50	Solution	30.11	7944	7857.00	1.10
t100m50r5-4.pl.json	100	50	Optimal	18.31	8296	8296.00	0.00
t100m50r5-5.pl.json	100	50	Optimal	9.79	9977	9977.00	0.00
t100m50r5-6.pl.json	100	50	Optimal	5.27	8240	8240.00	0.00
t100m50r5-7.pl.json	100	50	Solution	30.11	10917	10904.00	0.12
t100m50r5-8.pl.json	100	50	Optimal	17.90	8293	8293.00	0.00
t100m50r5-9.pl.json	100	50	Solution	30.12	7879	7622.00	3.26
t20m10r10-1.pl.json	20	10	Optimal	0.06	1337	1337.00	0.00
t20m10r10-10.pl.json	20	10	Optimal	0.05	3882	3882.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t20m10r10-11.pl.json	20	10	Optimal	0.08	2002	2002.00	0.00
t20m10r10-12.pl.json	20	10	Optimal	0.05	1257	1257.00	0.00
t20m10r10-13.pl.json	20	10	Optimal	0.08	2110	2110.00	0.00
t20m10r10-14.pl.json	20	10	Optimal	0.04	2546	2546.00	0.00
t20m10r10-15.pl.json	20	10	Optimal	0.05	3344	3344.00	0.00
t20m10r10-16.pl.json	20	10	Optimal	0.68	1643	1643.00	0.00
t20m10r10-17.pl.json	20	10	Optimal	0.06	1069	1069.00	0.00
t20m10r10-18.pl.json	20	10	Optimal	0.06	3041	3041.00	0.00
t20m10r10-19.pl.json	20	10	Optimal	0.05	2422	2422.00	0.00
t20m10r10-2.pl.json	20	10	Optimal	0.07	1819	1819.00	0.00
t20m10r10-20.pl.json	20	10	Optimal	0.05	1595	1595.00	0.00
t20m10r10-3.pl.json	20	10	Solution	30.02	843	771.00	8.54
t20m10r10-4.pl.json	20	10	Optimal	0.07	1396	1396.00	0.00
t20m10r10-5.pl.json	20	10	Optimal	0.07	1710	1710.00	0.00
t20m10r10-6.pl.json	20	10	Optimal	0.06	2434	2434.00	0.00
t20m10r10-7.pl.json	20	10	Optimal	0.12	2696	2696.00	0.00
t20m10r10-8.pl.json	20	10	Optimal	0.05	1329	1329.00	0.00
t20m10r10-9.pl.json	20	10	Optimal	0.93	2933	2933.00	0.00
t20m10r3-1.pl.json	20	10	Optimal	0.05	1876	1876.00	0.00
t20m10r3-10.pl.json	20	10	Optimal	0.06	1652	1652.00	0.00
t20m10r3-11.pl.json	20	10	Optimal	0.04	1640	1640.00	0.00
t20m10r3-12.pl.json	20	10	Optimal	0.07	1758	1758.00	0.00
t20m10r3-13.pl.json	20	10	Optimal	0.06	3099	3099.00	0.00
t20m10r3-14.pl.json	20	10	Optimal	1.76	3891	3891.00	0.00
t20m10r3-15.pl.json	20	10	Optimal	0.07	1433	1433.00	0.00
t20m10r3-16.pl.json	20	10	Optimal	0.06	1564	1564.00	0.00
t20m10r3-17.pl.json	20	10	Optimal	0.06	2321	2321.00	0.00
t20m10r3-18.pl.json	20	10	Solution	30.05	821	746.00	9.14
t20m10r3-19.pl.json	20	10	Optimal	0.07	1236	1236.00	0.00
t20m10r3-2.pl.json	20	10	Optimal	0.06	3258	3258.00	0.00
t20m10r3-20.pl.json	20	10	Optimal	0.04	2168	2168.00	0.00
t20m10r3-3.pl.json	20	10	Optimal	0.04	2255	2255.00	0.00
t20m10r3-4.pl.json	20	10	Optimal	0.09	2707	2707.00	0.00
t20m10r3-5.pl.json	20	10	Optimal	0.06	2381	2381.00	0.00
t20m10r3-6.pl.json	20	10	Optimal	0.07	3043	3043.00	0.00
t20m10r3-7.pl.json	20	10	Optimal	0.05	1738	1738.00	0.00
t20m10r3-8.pl.json	20	10	Optimal	0.18	1278	1278.00	0.00
t20m10r3-9.pl.json	20	10	Optimal	0.05	2874	2874.00	0.00
t20m10r5-1.pl.json	20	10	Optimal	0.06	2586	2586.00	0.00
t20m10r5-10.pl.json	20	10	Optimal	0.07	2260	2260.00	0.00
t20m10r5-11.pl.json	20	10	Optimal	0.05	3487	3487.00	0.00
t20m10r5-12.pl.json	20	10	Optimal	0.05	1559	1559.00	0.00
t20m10r5-13.pl.json	20	10	Optimal	0.06	1457	1457.00	0.00
t20m10r5-14.pl.json	20	10	Optimal	0.08	1141	1141.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t20m10r5-15.pl.json	20	10	Optimal	0.14	821	821.00	0.00
t20m10r5-16.pl.json	20	10	Optimal	0.06	2910	2910.00	0.00
t20m10r5-17.pl.json	20	10	Optimal	0.07	2337	2337.00	0.00
t20m10r5-18.pl.json	20	10	Optimal	0.80	2920	2920.00	0.00
t20m10r5-19.pl.json	20	10	Optimal	0.04	1952	1952.00	0.00
t20m10r5-2.pl.json	20	10	Optimal	0.06	1639	1639.00	0.00
t20m10r5-20.pl.json	20	10	Optimal	0.04	2660	2660.00	0.00
t20m10r5-3.pl.json	20	10	Optimal	0.06	1406	1406.00	0.00
t20m10r5-4.pl.json	20	10	Optimal	0.07	2658	2658.00	0.00
t20m10r5-5.pl.json	20	10	Optimal	0.09	794	794.00	0.00
t20m10r5-6.pl.json	20	10	Optimal	0.06	2398	2398.00	0.00
t20m10r5-7.pl.json	20	10	Optimal	0.04	1430	1430.00	0.00
t20m10r5-8.pl.json	20	10	Optimal	0.09	976	976.00	0.00
t20m10r5-9.pl.json	20	10	Optimal	0.06	2953	2953.00	0.00
t30m10r10-1.pl.json	30	10	Optimal	3.50	3344	3344.00	0.00
t30m10r10-10.pl.json	30	10	Solution	30.03	4692	4146.00	11.64
t30m10r10-11.pl.json	30	10	Optimal	0.12	2905	2905.00	0.00
t30m10r10-12.pl.json	30	10	Optimal	0.11	3672	3672.00	0.00
t30m10r10-13.pl.json	30	10	Optimal	0.15	2778	2778.00	0.00
t30m10r10-14.pl.json	30	10	Optimal	1.59	2741	2741.00	0.00
t30m10r10-15.pl.json	30	10	Optimal	0.12	2388	2388.00	0.00
t30m10r10-16.pl.json	30	10	Optimal	3.04	4225	4225.00	0.00
t30m10r10-17.pl.json	30	10	Optimal	0.11	1504	1504.00	0.00
t30m10r10-18.pl.json	30	10	Optimal	7.37	3287	3287.00	0.00
t30m10r10-19.pl.json	30	10	Optimal	0.11	3874	3874.00	0.00
t30m10r10-2.pl.json	30	10	Optimal	0.09	3169	3169.00	0.00
t30m10r10-20.pl.json	30	10	Optimal	0.07	2691	2691.00	0.00
t30m10r10-3.pl.json	30	10	Solution	30.02	3360	2851.00	15.15
t30m10r10-4.pl.json	30	10	Optimal	0.08	3452	3452.00	0.00
t30m10r10-5.pl.json	30	10	Optimal	0.08	2785	2785.00	0.00
t30m10r10-6.pl.json	30	10	Solution	30.09	1011	775.00	23.34
t30m10r10-7.pl.json	30	10	Optimal	4.10	3755	3755.00	0.00
t30m10r10-8.pl.json	30	10	Optimal	11.44	4613	4613.00	0.00
t30m10r10-9.pl.json	30	10	Optimal	0.08	2770	2770.00	0.00
t30m10r3-1.pl.json	30	10	Optimal	0.17	2901	2901.00	0.00
t30m10r3-10.pl.json	30	10	Optimal	0.10	4829	4829.00	0.00
t30m10r3-11.pl.json	30	10	Optimal	0.09	2584	2584.00	0.00
t30m10r3-12.pl.json	30	10	Optimal	0.08	2130	2130.00	0.00
t30m10r3-13.pl.json	30	10	Optimal	0.07	4253	4253.00	0.00
t30m10r3-14.pl.json	30	10	Optimal	0.16	1393	1393.00	0.00
t30m10r3-15.pl.json	30	10	Optimal	0.11	4149	4149.00	0.00
t30m10r3-16.pl.json	30	10	Optimal	0.23	2027	2027.00	0.00
t30m10r3-17.pl.json	30	10	Optimal	0.11	2975	2975.00	0.00
t30m10r3-18.pl.json	30	10	Optimal	0.13	5477	5477.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t30m10r3-19.pl.json	30	10	Solution	30.02	1288	1042.00	19.10
t30m10r3-2.pl.json	30	10	Optimal	0.15	2523	2523.00	0.00
t30m10r3-20.pl.json	30	10	Optimal	0.09	4754	4754.00	0.00
t30m10r3-3.pl.json	30	10	Optimal	0.07	2793	2793.00	0.00
t30m10r3-4.pl.json	30	10	Optimal	0.97	2809	2809.00	0.00
t30m10r3-5.pl.json	30	10	Optimal	0.14	3758	3758.00	0.00
t30m10r3-6.pl.json	30	10	Optimal	0.06	2870	2870.00	0.00
t30m10r3-7.pl.json	30	10	Optimal	0.13	2122	2122.00	0.00
t30m10r3-8.pl.json	30	10	Optimal	0.13	2862	2862.00	0.00
t30m10r3-9.pl.json	30	10	Optimal	0.09	2754	2754.00	0.00
t30m10r5-1.pl.json	30	10	Optimal	0.09	1998	1998.00	0.00
t30m10r5-10.pl.json	30	10	Optimal	0.12	3743	3743.00	0.00
t30m10r5-11.pl.json	30	10	Optimal	0.12	2138	2138.00	0.00
t30m10r5-12.pl.json	30	10	Optimal	0.08	2251	2251.00	0.00
t30m10r5-13.pl.json	30	10	Optimal	0.10	2632	2632.00	0.00
t30m10r5-14.pl.json	30	10	Optimal	0.11	2201	2201.00	0.00
t30m10r5-15.pl.json	30	10	Optimal	0.10	2339	2339.00	0.00
t30m10r5-16.pl.json	30	10	Optimal	0.17	4293	4293.00	0.00
t30m10r5-17.pl.json	30	10	Optimal	0.15	1314	1314.00	0.00
t30m10r5-18.pl.json	30	10	Optimal	0.09	2169	2169.00	0.00
t30m10r5-19.pl.json	30	10	Solution	30.14	1346	1279.00	4.98
t30m10r5-2.pl.json	30	10	Optimal	0.05	2399	2399.00	0.00
t30m10r5-20.pl.json	30	10	Optimal	0.18	1486	1486.00	0.00
t30m10r5-3.pl.json	30	10	Optimal	0.08	2494	2494.00	0.00
t30m10r5-4.pl.json	30	10	Optimal	0.11	3405	3405.00	0.00
t30m10r5-5.pl.json	30	10	Optimal	3.99	5243	5243.00	0.00
t30m10r5-6.pl.json	30	10	Optimal	0.09	2382	2382.00	0.00
t30m10r5-7.pl.json	30	10	Optimal	0.10	2018	2018.00	0.00
t30m10r5-8.pl.json	30	10	Optimal	0.13	3089	3089.00	0.00
t30m10r5-9.pl.json	30	10	Optimal	0.12	3704	3704.00	0.00
t30m20r10-1.pl.json	30	20	Solution	30.01	3702	2850.00	23.01
t30m20r10-10.pl.json	30	20	Optimal	0.11	2508	2508.00	0.00
t30m20r10-11.pl.json	30	20	Optimal	1.75	3648	3648.00	0.00
t30m20r10-12.pl.json	30	20	Optimal	0.36	4214	4214.00	0.00
t30m20r10-13.pl.json	30	20	Optimal	6.20	3980	3980.00	0.00
t30m20r10-14.pl.json	30	20	Optimal	0.17	3141	3141.00	0.00
t30m20r10-15.pl.json	30	20	Solution	30.03	4322	3457.00	20.01
t30m20r10-16.pl.json	30	20	Optimal	0.22	4002	4002.00	0.00
t30m20r10-17.pl.json	30	20	Optimal	19.13	4161	4161.00	0.00
t30m20r10-18.pl.json	30	20	Optimal	3.59	1992	1992.00	0.00
t30m20r10-19.pl.json	30	20	Optimal	0.17	2789	2789.00	0.00
t30m20r10-2.pl.json	30	20	Optimal	20.44	3982	3982.00	0.00
t30m20r10-20.pl.json	30	20	Optimal	0.18	2314	2314.00	0.00
t30m20r10-3.pl.json	30	20	Optimal	0.15	2158	2158.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t30m20r10-4.pl.json	30	20	Optimal	6.52	4040	4040.00	0.00
t30m20r10-5.pl.json	30	20	Optimal	0.14	1237	1237.00	0.00
t30m20r10-6.pl.json	30	20	Optimal	3.53	3770	3770.00	0.00
t30m20r10-7.pl.json	30	20	Optimal	0.18	2266	2266.00	0.00
t30m20r10-8.pl.json	30	20	Optimal	0.45	1855	1855.00	0.00
t30m20r10-9.pl.json	30	20	Optimal	0.80	2028	2028.00	0.00
t30m20r3-1.pl.json	30	20	Optimal	0.17	2200	2200.00	0.00
t30m20r3-10.pl.json	30	20	Optimal	0.13	3291	3291.00	0.00
t30m20r3-11.pl.json	30	20	Optimal	0.22	4473	4473.00	0.00
t30m20r3-12.pl.json	30	20	Optimal	3.75	5060	5060.00	0.00
t30m20r3-13.pl.json	30	20	Optimal	0.14	3536	3536.00	0.00
t30m20r3-14.pl.json	30	20	Optimal	0.15	3432	3432.00	0.00
t30m20r3-15.pl.json	30	20	Optimal	0.14	3463	3463.00	0.00
t30m20r3-16.pl.json	30	20	Optimal	0.16	3893	3893.00	0.00
t30m20r3-17.pl.json	30	20	Optimal	0.19	1892	1892.00	0.00
t30m20r3-18.pl.json	30	20	Optimal	0.16	2653	2653.00	0.00
t30m20r3-19.pl.json	30	20	Optimal	0.18	3141	3141.00	0.00
t30m20r3-2.pl.json	30	20	Optimal	0.15	1251	1251.00	0.00
t30m20r3-20.pl.json	30	20	Optimal	2.08	2745	2745.00	0.00
t30m20r3-3.pl.json	30	20	Optimal	0.18	3434	3434.00	0.00
t30m20r3-4.pl.json	30	20	Optimal	0.19	2394	2394.00	0.00
t30m20r3-5.pl.json	30	20	Optimal	0.12	3776	3776.00	0.00
t30m20r3-6.pl.json	30	20	Optimal	0.20	2250	2250.00	0.00
t30m20r3-7.pl.json	30	20	Optimal	0.21	1693	1693.00	0.00
t30m20r3-8.pl.json	30	20	Optimal	0.12	4997	4997.00	0.00
t30m20r3-9.pl.json	30	20	Optimal	0.16	4898	4898.00	0.00
t30m20r5-1.pl.json	30	20	Optimal	2.62	3195	3195.00	0.00
t30m20r5-10.pl.json	30	20	Optimal	0.72	2133	2133.00	0.00
t30m20r5-11.pl.json	30	20	Optimal	0.17	3974	3974.00	0.00
t30m20r5-12.pl.json	30	20	Optimal	0.16	2197	2197.00	0.00
t30m20r5-13.pl.json	30	20	Optimal	0.15	2296	2296.00	0.00
t30m20r5-14.pl.json	30	20	Optimal	0.21	3861	3861.00	0.00
t30m20r5-15.pl.json	30	20	Optimal	0.16	2353	2353.00	0.00
t30m20r5-16.pl.json	30	20	Optimal	1.80	2751	2751.00	0.00
t30m20r5-17.pl.json	30	20	Optimal	0.22	3555	3555.00	0.00
t30m20r5-18.pl.json	30	20	Optimal	0.14	2384	2384.00	0.00
t30m20r5-19.pl.json	30	20	Optimal	0.17	2080	2080.00	0.00
t30m20r5-2.pl.json	30	20	Optimal	0.11	1715	1715.00	0.00
t30m20r5-20.pl.json	30	20	Optimal	0.15	4176	4176.00	0.00
t30m20r5-3.pl.json	30	20	Optimal	15.15	4528	4528.00	0.00
t30m20r5-4.pl.json	30	20	Optimal	0.20	3083	3083.00	0.00
t30m20r5-5.pl.json	30	20	Optimal	0.12	1969	1969.00	0.00
t30m20r5-6.pl.json	30	20	Optimal	0.15	4250	4250.00	0.00
t30m20r5-7.pl.json	30	20	Optimal	0.19	3036	3036.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t30m20r5-8.pl.json	30	20	Optimal	2.07	2834	2834.00	0.00
t30m20r5-9.pl.json	30	20	Optimal	0.16	2343	2343.00	0.00
t40m10r10-1.pl.json	40	10	Optimal	0.18	2514	2514.00	0.00
t40m10r10-10.pl.json	40	10	Optimal	0.18	3557	3557.00	0.00
t40m10r10-11.pl.json	40	10	Solution	30.03	4556	4262.00	6.45
t40m10r10-12.pl.json	40	10	Solution	30.04	5225	4355.00	16.65
t40m10r10-13.pl.json	40	10	Optimal	5.66	2789	2789.00	0.00
t40m10r10-14.pl.json	40	10	Optimal	0.34	1648	1648.00	0.00
t40m10r10-15.pl.json	40	10	Optimal	1.53	1844	1844.00	0.00
t40m10r10-16.pl.json	40	10	Optimal	9.44	3749	3749.00	0.00
t40m10r10-17.pl.json	40	10	Optimal	0.15	2363	2363.00	0.00
t40m10r10-18.pl.json	40	10	Optimal	0.23	4973	4973.00	0.00
t40m10r10-19.pl.json	40	10	Optimal	0.26	3181	3181.00	0.00
t40m10r10-2.pl.json	40	10	Optimal	0.24	2350	2350.00	0.00
t40m10r10-20.pl.json	40	10	Optimal	11.15	2730	2730.00	0.00
t40m10r10-3.pl.json	40	10	Optimal	0.17	3717	3717.00	0.00
t40m10r10-4.pl.json	40	10	Optimal	0.17	3414	3414.00	0.00
t40m10r10-5.pl.json	40	10	Optimal	2.53	2852	2852.00	0.00
t40m10r10-6.pl.json	40	10	Optimal	8.05	3262	3262.00	0.00
t40m10r10-7.pl.json	40	10	Optimal	0.15	4572	4572.00	0.00
t40m10r10-8.pl.json	40	10	Optimal	6.04	3776	3776.00	0.00
t40m10r10-9.pl.json	40	10	Optimal	0.34	2524	2524.00	0.00
t40m10r3-1.pl.json	40	10	Optimal	0.17	4832	4832.00	0.00
t40m10r3-10.pl.json	40	10	Optimal	0.12	2442	2442.00	0.00
t40m10r3-11.pl.json	40	10	Optimal	0.52	3218	3218.00	0.00
t40m10r3-12.pl.json	40	10	Optimal	0.11	3863	3863.00	0.00
t40m10r3-13.pl.json	40	10	Optimal	0.41	3564	3564.00	0.00
t40m10r3-14.pl.json	40	10	Optimal	0.15	4913	4913.00	0.00
t40m10r3-15.pl.json	40	10	Optimal	0.21	3785	3785.00	0.00
t40m10r3-16.pl.json	40	10	Optimal	0.37	2840	2840.00	0.00
t40m10r3-17.pl.json	40	10	Optimal	0.20	5506	5506.00	0.00
t40m10r3-18.pl.json	40	10	Optimal	0.38	3848	3848.00	0.00
t40m10r3-19.pl.json	40	10	Optimal	0.27	2259	2259.00	0.00
t40m10r3-2.pl.json	40	10	Solution	30.18	1729	1589.00	8.10
t40m10r3-20.pl.json	40	10	Optimal	0.26	4157	4157.00	0.00
t40m10r3-3.pl.json	40	10	Optimal	0.33	4903	4903.00	0.00
t40m10r3-4.pl.json	40	10	Solution	30.02	1633	1341.00	17.88
t40m10r3-5.pl.json	40	10	Optimal	0.34	1984	1984.00	0.00
t40m10r3-6.pl.json	40	10	Optimal	0.35	5005	5005.00	0.00
t40m10r3-7.pl.json	40	10	Solution	30.02	5545	5188.00	6.44
t40m10r3-8.pl.json	40	10	Optimal	0.24	3658	3658.00	0.00
t40m10r3-9.pl.json	40	10	Optimal	0.36	3830	3830.00	0.00
t40m10r5-1.pl.json	40	10	Optimal	0.20	4857	4857.00	0.00
t40m10r5-10.pl.json	40	10	Optimal	0.20	3989	3989.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t40m10r5-11.pl.json	40	10	Optimal	0.33	5238	5238.00	0.00
t40m10r5-12.pl.json	40	10	Optimal	0.42	4584	4584.00	0.00
t40m10r5-13.pl.json	40	10	Optimal	0.40	2307	2307.00	0.00
t40m10r5-14.pl.json	40	10	Optimal	0.21	1826	1826.00	0.00
t40m10r5-15.pl.json	40	10	Optimal	0.17	1926	1926.00	0.00
t40m10r5-16.pl.json	40	10	Optimal	0.26	5216	5216.00	0.00
t40m10r5-17.pl.json	40	10	Optimal	0.14	7162	7162.00	0.00
t40m10r5-18.pl.json	40	10	Optimal	0.24	4892	4892.00	0.00
t40m10r5-19.pl.json	40	10	Optimal	0.18	4027	4027.00	0.00
t40m10r5-2.pl.json	40	10	Optimal	3.51	4099	4099.00	0.00
t40m10r5-20.pl.json	40	10	Optimal	10.41	4899	4899.00	0.00
t40m10r5-3.pl.json	40	10	Optimal	0.64	3113	3113.00	0.00
t40m10r5-4.pl.json	40	10	Optimal	0.21	6626	6626.00	0.00
t40m10r5-5.pl.json	40	10	Optimal	0.25	3828	3828.00	0.00
t40m10r5-6.pl.json	40	10	Optimal	0.33	4213	4213.00	0.00
t40m10r5-7.pl.json	40	10	Optimal	0.21	4303	4303.00	0.00
t40m10r5-8.pl.json	40	10	Solution	30.02	3559	3189.00	10.40
t40m10r5-9.pl.json	40	10	Optimal	0.30	1953	1953.00	0.00
t40m20r10-1.pl.json	40	20	Solution	30.05	4518	3972.00	12.08
t40m20r10-10.pl.json	40	20	Optimal	4.24	3862	3862.00	0.00
t40m20r10-11.pl.json	40	20	Optimal	0.21	1952	1952.00	0.00
t40m20r10-12.pl.json	40	20	Optimal	0.71	4129	4129.00	0.00
t40m20r10-13.pl.json	40	20	Optimal	0.23	2927	2927.00	0.00
t40m20r10-14.pl.json	40	20	Optimal	6.14	2701	2701.00	0.00
t40m20r10-15.pl.json	40	20	Optimal	6.72	3168	3168.00	0.00
t40m20r10-16.pl.json	40	20	Optimal	0.15	2812	2812.00	0.00
t40m20r10-17.pl.json	40	20	Optimal	8.83	4288	4288.00	0.00
t40m20r10-18.pl.json	40	20	Optimal	8.25	3611	3611.00	0.00
t40m20r10-19.pl.json	40	20	Optimal	1.71	2891	2891.00	0.00
t40m20r10-2.pl.json	40	20	Optimal	0.16	3284	3284.00	0.00
t40m20r10-20.pl.json	40	20	Optimal	23.67	5506	5506.00	0.00
t40m20r10-3.pl.json	40	20	Solution	30.03	5981	5478.00	8.41
t40m20r10-4.pl.json	40	20	Optimal	0.16	3409	3409.00	0.00
t40m20r10-5.pl.json	40	20	Solution	30.04	5113	4278.00	16.33
t40m20r10-6.pl.json	40	20	Optimal	21.04	2376	2376.00	0.00
t40m20r10-7.pl.json	40	20	Optimal	18.53	4799	4799.00	0.00
t40m20r10-8.pl.json	40	20	Optimal	6.17	3924	3924.00	0.00
t40m20r10-9.pl.json	40	20	Optimal	4.28	2043	2043.00	0.00
t40m20r3-1.pl.json	40	20	Optimal	0.26	3524	3524.00	0.00
t40m20r3-10.pl.json	40	20	Optimal	0.60	3110	3110.00	0.00
t40m20r3-11.pl.json	40	20	Optimal	0.22	3695	3695.00	0.00
t40m20r3-12.pl.json	40	20	Optimal	0.31	4828	4828.00	0.00
t40m20r3-13.pl.json	40	20	Optimal	0.35	4010	4010.00	0.00
t40m20r3-14.pl.json	40	20	Optimal	0.14	2752	2752.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t40m20r3-15.pl.json	40	20	Optimal	0.22	3312	3312.00	0.00
t40m20r3-16.pl.json	40	20	Optimal	0.41	4304	4304.00	0.00
t40m20r3-17.pl.json	40	20	Optimal	0.29	3991	3991.00	0.00
t40m20r3-18.pl.json	40	20	Optimal	0.27	5733	5733.00	0.00
t40m20r3-19.pl.json	40	20	Optimal	0.24	3581	3581.00	0.00
t40m20r3-2.pl.json	40	20	Optimal	0.30	4869	4869.00	0.00
t40m20r3-20.pl.json	40	20	Optimal	0.34	3514	3514.00	0.00
t40m20r3-3.pl.json	40	20	Optimal	0.27	2503	2503.00	0.00
t40m20r3-4.pl.json	40	20	Optimal	0.21	4323	4323.00	0.00
t40m20r3-5.pl.json	40	20	Optimal	0.29	3626	3626.00	0.00
t40m20r3-6.pl.json	40	20	Optimal	0.22	2488	2488.00	0.00
t40m20r3-7.pl.json	40	20	Optimal	0.16	3470	3470.00	0.00
t40m20r3-8.pl.json	40	20	Optimal	0.84	6730	6730.00	0.00
t40m20r3-9.pl.json	40	20	Optimal	0.23	4656	4656.00	0.00
t40m20r5-1.pl.json	40	20	Optimal	0.20	1318	1318.00	0.00
t40m20r5-10.pl.json	40	20	Optimal	0.27	2216	2216.00	0.00
t40m20r5-11.pl.json	40	20	Optimal	0.23	3538	3538.00	0.00
t40m20r5-12.pl.json	40	20	Optimal	0.33	5346	5346.00	0.00
t40m20r5-13.pl.json	40	20	Optimal	21.99	4589	4589.00	0.00
t40m20r5-14.pl.json	40	20	Optimal	0.21	2243	2243.00	0.00
t40m20r5-15.pl.json	40	20	Optimal	8.96	3869	3869.00	0.00
t40m20r5-16.pl.json	40	20	Optimal	0.28	4319	4319.00	0.00
t40m20r5-17.pl.json	40	20	Optimal	0.21	4866	4866.00	0.00
t40m20r5-18.pl.json	40	20	Optimal	0.66	5802	5802.00	0.00
t40m20r5-19.pl.json	40	20	Optimal	10.46	4197	4197.00	0.00
t40m20r5-2.pl.json	40	20	Optimal	0.17	2634	2634.00	0.00
t40m20r5-20.pl.json	40	20	Solution	30.05	6482	6232.00	3.86
t40m20r5-3.pl.json	40	20	Optimal	0.38	4391	4391.00	0.00
t40m20r5-4.pl.json	40	20	Optimal	5.34	4610	4610.00	0.00
t40m20r5-5.pl.json	40	20	Optimal	0.17	3105	3105.00	0.00
t40m20r5-6.pl.json	40	20	Optimal	0.21	4760	4760.00	0.00
t40m20r5-7.pl.json	40	20	Optimal	0.22	1218	1218.00	0.00
t40m20r5-8.pl.json	40	20	Optimal	0.20	2601	2601.00	0.00
t40m20r5-9.pl.json	40	20	Optimal	0.17	3141	3141.00	0.00
t500m100r10-1.pl.json	500	100	Solution	34.47	99985	44508.00	55.49
t500m100r10-10.pl.json	500	100	Solution	36.70	99989	35930.00	64.07
t500m100r10-11.pl.json	500	100	Solution	37.37	99998	31878.00	68.12
t500m100r10-12.pl.json	500	100	Solution	41.73	99997	44533.00	55.47
t500m100r10-13.pl.json	500	100	Solution	40.49	99999	37955.00	62.04
t500m100r10-14.pl.json	500	100	Solution	36.97	99990	34723.00	65.27
t500m100r10-15.pl.json	500	100	Solution	40.76	100000	35403.00	64.60
t500m100r10-16.pl.json	500	100	Solution	39.01	99999	33693.00	66.31
t500m100r10-17.pl.json	500	100	Solution	42.46	99997	28688.00	71.31
t500m100r10-18.pl.json	500	100	Solution	42.66	100000	37334.00	62.67

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m100r10-19.pl.json	500	100	Solution	43.40	100000	40128.00	59.87
t500m100r10-2.pl.json	500	100	Solution	43.11	100000	37597.00	62.40
t500m100r10-20.pl.json	500	100	Solution	42.96	100000	30194.00	69.81
t500m100r10-3.pl.json	500	100	Solution	43.67	99999	31662.00	68.34
t500m100r10-4.pl.json	500	100	Solution	43.11	99993	35350.00	64.65
t500m100r10-5.pl.json	500	100	Solution	44.75	99996	30335.00	69.66
t500m100r10-6.pl.json	500	100	Solution	41.60	99986	35654.00	64.34
t500m100r10-7.pl.json	500	100	Solution	89.79	99991	35760.00	64.24
t500m100r10-8.pl.json	500	100	Solution	81.73	99990	37775.00	62.22
t500m100r10-9.pl.json	500	100	Solution	43.73	100000	34951.00	65.05
t500m100r3-1.pl.json	500	100	Solution	42.91	99985	37887.00	62.11
t500m100r3-10.pl.json	500	100	Solution	43.92	99993	41592.00	58.41
t500m100r3-11.pl.json	500	100	Solution	46.47	99996	36331.00	63.67
t500m100r3-12.pl.json	500	100	Solution	45.82	100000	36704.00	63.30
t500m100r3-13.pl.json	500	100	Solution	42.12	99995	35381.00	64.62
t500m100r3-14.pl.json	500	100	Solution	88.74	99982	40411.00	59.58
t500m100r3-15.pl.json	500	100	Solution	44.26	99992	38658.00	61.34
t500m100r3-16.pl.json	500	100	Solution	93.53	99986	39443.00	60.55
t500m100r3-17.pl.json	500	100	Solution	42.16	99994	54487.00	45.51
t500m100r3-18.pl.json	500	100	Solution	91.03	100000	38068.00	61.93
t500m100r3-19.pl.json	500	100	Solution	48.15	100000	41896.00	58.10
t500m100r3-2.pl.json	500	100	Solution	48.01	99993	41211.00	58.79
t500m100r3-20.pl.json	500	100	Solution	42.84	100000	37671.00	62.33
t500m100r3-3.pl.json	500	100	Solution	88.52	99990	35084.00	64.91
t500m100r3-4.pl.json	500	100	Solution	47.32	99997	32016.00	67.98
t500m100r3-5.pl.json	500	100	Solution	47.73	100000	38298.00	61.70
t500m100r3-6.pl.json	500	100	Solution	44.73	99979	46003.00	53.99
t500m100r3-7.pl.json	500	100	Solution	47.33	99998	37262.00	62.74
t500m100r3-8.pl.json	500	100	Solution	46.35	99996	40827.00	59.17
t500m100r3-9.pl.json	500	100	Solution	44.71	99998	44625.00	55.37
t500m100r5-1.pl.json	500	100	Solution	34.78	99995	34446.00	65.55
t500m100r5-10.pl.json	500	100	Solution	37.04	100000	27639.00	72.36
t500m100r5-11.pl.json	500	100	Solution	35.72	100000	35280.00	64.72
t500m100r5-12.pl.json	500	100	Solution	31.74	99993	37187.00	62.81
t500m100r5-13.pl.json	500	100	Solution	39.48	99998	43728.00	56.27
t500m100r5-14.pl.json	500	100	Solution	37.64	100000	38862.00	61.14
t500m100r5-15.pl.json	500	100	Solution	37.56	99991	36096.00	63.90
t500m100r5-16.pl.json	500	100	Solution	41.37	100000	34669.00	65.33
t500m100r5-17.pl.json	500	100	Solution	41.38	99999	37944.00	62.06
t500m100r5-18.pl.json	500	100	Solution	41.58	99996	42744.00	57.25
t500m100r5-19.pl.json	500	100	Solution	42.75	99997	44310.00	55.69
t500m100r5-2.pl.json	500	100	Solution	41.26	99999	40905.00	59.09
t500m100r5-20.pl.json	500	100	Solution	41.73	99999	38404.00	61.60
t500m100r5-3.pl.json	500	100	Solution	43.39	99997	38651.00	61.35

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m100r5-4.pl.json	500	100	Solution	43.76	99991	30938.00	69.06
t500m100r5-5.pl.json	500	100	Solution	38.67	100000	37915.00	62.09
t500m100r5-6.pl.json	500	100	Solution	44.47	99984	40363.00	59.63
t500m100r5-7.pl.json	500	100	Solution	43.93	99992	40749.00	59.25
t500m100r5-8.pl.json	500	100	Solution	46.34	100000	37050.00	62.95
t500m100r5-9.pl.json	500	100	Solution	44.35	99992	39160.00	60.84
t500m10r10-1.pl.json	500	10	Solution	30.11	95746	42756.00	55.34
t500m10r10-10.pl.json	500	10	Solution	30.08	95000	30745.00	67.64
t500m10r10-11.pl.json	500	10	Solution	30.06	94588	42832.00	54.72
t500m10r10-12.pl.json	500	10	Solution	30.09	93713	35908.00	61.68
t500m10r10-13.pl.json	500	10	Solution	30.07	95952	38554.00	59.82
t500m10r10-14.pl.json	500	10	Solution	30.06	94768	34152.00	63.96
t500m10r10-15.pl.json	500	10	Solution	30.07	96018	32118.00	66.55
t500m10r10-16.pl.json	500	10	Solution	30.07	94780	32243.00	65.98
t500m10r10-17.pl.json	500	10	Solution	30.07	96565	32882.00	65.95
t500m10r10-18.pl.json	500	10	Solution	30.08	94982	33101.00	65.15
t500m10r10-19.pl.json	500	10	Solution	30.07	95235	40550.00	57.42
t500m10r10-2.pl.json	500	10	Solution	30.06	93974	34094.00	63.72
t500m10r10-20.pl.json	500	10	Solution	30.09	94572	36034.00	61.90
t500m10r10-3.pl.json	500	10	Solution	30.06	95991	34790.00	63.76
t500m10r10-4.pl.json	500	10	Solution	30.05	94949	40391.00	57.46
t500m10r10-5.pl.json	500	10	Solution	30.09	96784	40910.00	57.73
t500m10r10-6.pl.json	500	10	Solution	30.07	94288	31591.00	66.50
t500m10r10-7.pl.json	500	10	Solution	30.06	96950	33091.00	65.87
t500m10r10-8.pl.json	500	10	Solution	30.05	95149	37700.00	60.38
t500m10r10-9.pl.json	500	10	Solution	30.07	93849	31331.00	66.62
t500m10r3-1.pl.json	500	10	Solution	30.06	92705	38470.00	58.50
t500m10r3-10.pl.json	500	10	Solution	30.06	96160	46481.00	51.66
t500m10r3-11.pl.json	500	10	Solution	30.10	95135	37621.00	60.46
t500m10r3-12.pl.json	500	10	Solution	30.06	93775	41276.00	55.98
t500m10r3-13.pl.json	500	10	Solution	30.06	96699	36639.00	62.11
t500m10r3-14.pl.json	500	10	Solution	30.09	95937	39052.00	59.29
t500m10r3-15.pl.json	500	10	Solution	30.08	96302	40506.00	57.94
t500m10r3-16.pl.json	500	10	Solution	30.08	94188	32654.00	65.33
t500m10r3-17.pl.json	500	10	Solution	30.09	94889	48574.00	48.81
t500m10r3-18.pl.json	500	10	Solution	30.07	94265	37386.00	60.34
t500m10r3-19.pl.json	500	10	Solution	30.06	95914	49330.00	48.57
t500m10r3-2.pl.json	500	10	Solution	30.16	97153	40595.00	58.22
t500m10r3-20.pl.json	500	10	Solution	30.07	92943	46331.00	50.15
t500m10r3-3.pl.json	500	10	Solution	30.08	94467	37399.00	60.41
t500m10r3-4.pl.json	500	10	Solution	30.05	97560	48637.00	50.15
t500m10r3-5.pl.json	500	10	Solution	30.07	94536	38945.00	58.80
t500m10r3-6.pl.json	500	10	Solution	30.06	96686	39113.00	59.55
t500m10r3-7.pl.json	500	10	Solution	30.09	96742	36212.00	62.57

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m10r3-8.pl.json	500	10	Solution	30.14	94423	42992.00	54.47
t500m10r3-9.pl.json	500	10	Solution	30.06	94916	41201.00	56.59
t500m10r5-1.pl.json	500	10	Solution	30.07	95693	38422.00	59.85
t500m10r5-10.pl.json	500	10	Solution	30.10	96968	40616.00	58.11
t500m10r5-11.pl.json	500	10	Solution	30.05	96445	43447.00	54.95
t500m10r5-12.pl.json	500	10	Solution	30.06	96045	35447.00	63.09
t500m10r5-13.pl.json	500	10	Solution	30.08	95556	41212.00	56.87
t500m10r5-14.pl.json	500	10	Solution	30.05	95732	37546.00	60.78
t500m10r5-15.pl.json	500	10	Solution	30.08	77582	36409.00	53.07
t500m10r5-16.pl.json	500	10	Solution	30.09	94243	37966.00	59.71
t500m10r5-17.pl.json	500	10	Solution	30.08	95414	41333.00	56.68
t500m10r5-18.pl.json	500	10	Solution	30.07	95623	40205.00	57.95
t500m10r5-19.pl.json	500	10	Solution	30.06	94847	38862.00	59.03
t500m10r5-2.pl.json	500	10	Solution	30.08	95895	36135.00	62.32
t500m10r5-20.pl.json	500	10	Solution	30.08	94987	42789.00	54.95
t500m10r5-3.pl.json	500	10	Solution	30.08	94696	41375.00	56.31
t500m10r5-4.pl.json	500	10	Solution	30.08	95774	34710.00	63.76
t500m10r5-5.pl.json	500	10	Solution	30.06	95351	33781.00	64.57
t500m10r5-6.pl.json	500	10	Solution	30.06	94254	41208.00	56.28
t500m10r5-7.pl.json	500	10	Solution	30.08	71786	37543.00	47.70
t500m10r5-8.pl.json	500	10	Solution	30.06	94893	40616.00	57.20
t500m10r5-9.pl.json	500	10	Solution	30.06	93998	37557.00	60.04
t500m20r10-1.pl.json	500	20	Solution	30.14	97697	35120.00	64.05
t500m20r10-10.pl.json	500	20	Solution	30.11	97516	34269.00	64.86
t500m20r10-11.pl.json	500	20	Solution	30.13	97580	33469.00	65.70
t500m20r10-12.pl.json	500	20	Solution	30.13	95009	36943.00	61.12
t500m20r10-13.pl.json	500	20	Solution	30.11	98196	36175.00	63.16
t500m20r10-14.pl.json	500	20	Solution	30.19	94915	34601.00	63.55
t500m20r10-15.pl.json	500	20	Solution	30.11	96944	32963.00	66.00
t500m20r10-16.pl.json	500	20	Solution	30.25	95596	37875.00	60.38
t500m20r10-17.pl.json	500	20	Solution	30.10	96973	34515.00	64.41
t500m20r10-18.pl.json	500	20	Solution	30.14	97844	35137.00	64.09
t500m20r10-19.pl.json	500	20	Solution	30.14	96900	37146.00	61.67
t500m20r10-2.pl.json	500	20	Solution	30.12	95672	39857.00	58.34
t500m20r10-20.pl.json	500	20	Solution	30.14	96470	35785.00	62.91
t500m20r10-3.pl.json	500	20	Solution	30.15	95282	35332.00	62.92
t500m20r10-4.pl.json	500	20	Solution	30.13	96463	30197.00	68.70
t500m20r10-5.pl.json	500	20	Solution	30.16	97742	39933.00	59.14
t500m20r10-6.pl.json	500	20	Solution	30.25	96682	33282.00	65.58
t500m20r10-7.pl.json	500	20	Solution	30.10	95513	30485.00	68.08
t500m20r10-8.pl.json	500	20	Solution	30.11	97048	37688.00	61.17
t500m20r10-9.pl.json	500	20	Solution	30.17	95122	40863.00	57.04
t500m20r3-1.pl.json	500	20	Solution	30.11	96331	36188.00	62.43
t500m20r3-10.pl.json	500	20	Solution	30.13	95729	42859.00	55.23

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m20r3-11.pl.json	500	20	Solution	30.11	95560	38401.00	59.81
t500m20r3-12.pl.json	500	20	Solution	30.12	95608	40309.00	57.84
t500m20r3-13.pl.json	500	20	Solution	30.11	97160	33374.00	65.65
t500m20r3-14.pl.json	500	20	Solution	30.10	47664	34978.00	26.62
t500m20r3-15.pl.json	500	20	Solution	30.25	94244	37664.00	60.04
t500m20r3-16.pl.json	500	20	Solution	30.13	95521	42848.00	55.14
t500m20r3-17.pl.json	500	20	Solution	30.15	97072	39524.00	59.28
t500m20r3-18.pl.json	500	20	Solution	30.11	95122	43126.00	54.66
t500m20r3-19.pl.json	500	20	Solution	30.11	44926	37033.00	17.57
t500m20r3-2.pl.json	500	20	Solution	30.12	96028	42127.00	56.13
t500m20r3-20.pl.json	500	20	Solution	30.10	94804	45628.00	51.87
t500m20r3-3.pl.json	500	20	Solution	30.25	97763	31170.00	68.12
t500m20r3-4.pl.json	500	20	Solution	30.11	94497	43640.00	53.82
t500m20r3-5.pl.json	500	20	Solution	30.15	96748	48397.00	49.98
t500m20r3-6.pl.json	500	20	Solution	30.11	96780	35195.00	63.63
t500m20r3-7.pl.json	500	20	Solution	30.12	96251	45611.00	52.61
t500m20r3-8.pl.json	500	20	Solution	30.25	97074	44320.00	54.34
t500m20r3-9.pl.json	500	20	Solution	30.11	95614	41018.00	57.10
t500m20r5-1.pl.json	500	20	Solution	30.25	97130	35280.00	63.68
t500m20r5-10.pl.json	500	20	Solution	30.11	96985	42735.00	55.94
t500m20r5-11.pl.json	500	20	Solution	30.13	94840	33780.00	64.38
t500m20r5-12.pl.json	500	20	Solution	30.11	94597	37117.00	60.76
t500m20r5-13.pl.json	500	20	Solution	30.13	97220	39429.00	59.44
t500m20r5-14.pl.json	500	20	Solution	30.11	96568	45311.00	53.08
t500m20r5-15.pl.json	500	20	Solution	30.12	95130	38015.00	60.04
t500m20r5-16.pl.json	500	20	Solution	30.15	94779	36087.00	61.93
t500m20r5-17.pl.json	500	20	Solution	30.11	98195	41447.00	57.79
t500m20r5-18.pl.json	500	20	Solution	30.13	94881	40783.00	57.02
t500m20r5-19.pl.json	500	20	Solution	30.11	95921	40972.00	57.29
t500m20r5-2.pl.json	500	20	Solution	30.12	95081	39591.00	58.36
t500m20r5-20.pl.json	500	20	Solution	30.14	95319	37542.00	60.61
t500m20r5-3.pl.json	500	20	Solution	30.14	95802	39647.00	58.62
t500m20r5-4.pl.json	500	20	Solution	30.23	96496	40300.00	58.24
t500m20r5-5.pl.json	500	20	Solution	30.16	96540	41014.00	57.52
t500m20r5-6.pl.json	500	20	Solution	30.13	94656	41439.00	56.22
t500m20r5-7.pl.json	500	20	Solution	30.14	96949	37547.00	61.27
t500m20r5-8.pl.json	500	20	Solution	30.11	95312	41282.00	56.69
t500m20r5-9.pl.json	500	20	Solution	30.20	95186	39384.00	58.62
t500m50r10-1.pl.json	500	50	Solution	30.26	98574	39376.00	60.05
t500m50r10-10.pl.json	500	50	Solution	30.53	97898	34844.00	64.41
t500m50r10-11.pl.json	500	50	Solution	30.31	97432	39722.00	59.23
t500m50r10-12.pl.json	500	50	Solution	30.27	97544	32276.00	66.91
t500m50r10-13.pl.json	500	50	Solution	30.33	98339	29550.00	69.95
t500m50r10-14.pl.json	500	50	Solution	34.32	97956	37824.00	61.39

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m50r10-15.pl.json	500	50	Solution	30.30	97960	33997.00	65.30
t500m50r10-16.pl.json	500	50	Solution	30.55	99118	31567.00	68.15
t500m50r10-17.pl.json	500	50	Solution	30.30	99163	28277.00	71.48
t500m50r10-18.pl.json	500	50	Solution	30.41	98458	39127.00	60.26
t500m50r10-19.pl.json	500	50	Solution	30.30	96340	38100.00	60.45
t500m50r10-2.pl.json	500	50	Solution	34.68	97717	37318.00	61.81
t500m50r10-20.pl.json	500	50	Solution	30.49	97088	32654.00	66.37
t500m50r10-3.pl.json	500	50	Solution	30.25	97120	36737.00	62.17
t500m50r10-4.pl.json	500	50	Solution	30.35	98732	36302.00	63.23
t500m50r10-5.pl.json	500	50	Solution	34.52	98061	31982.00	67.39
t500m50r10-6.pl.json	500	50	Solution	30.34	96562	28608.00	70.37
t500m50r10-7.pl.json	500	50	Solution	30.55	96332	30074.00	68.78
t500m50r10-8.pl.json	500	50	Solution	30.28	97888	39978.00	59.16
t500m50r10-9.pl.json	500	50	Solution	30.33	96470	35216.00	63.50
t500m50r3-1.pl.json	500	50	Solution	30.29	96953	43548.00	55.08
t500m50r3-10.pl.json	500	50	Solution	34.27	96965	43200.00	55.45
t500m50r3-11.pl.json	500	50	Solution	30.47	97740	40426.00	58.64
t500m50r3-12.pl.json	500	50	Solution	30.28	97264	36948.00	62.01
t500m50r3-13.pl.json	500	50	Solution	30.30	97299	38482.00	60.45
t500m50r3-14.pl.json	500	50	Solution	30.26	95702	33747.00	64.74
t500m50r3-15.pl.json	500	50	Solution	30.44	95916	39597.00	58.72
t500m50r3-16.pl.json	500	50	Solution	34.46	97474	42361.00	56.54
t500m50r3-17.pl.json	500	50	Solution	30.47	98815	36939.00	62.62
t500m50r3-18.pl.json	500	50	Solution	30.33	97270	42601.00	56.20
t500m50r3-19.pl.json	500	50	Solution	30.27	97126	34933.00	64.03
t500m50r3-2.pl.json	500	50	Solution	34.38	97040	39261.00	59.54
t500m50r3-20.pl.json	500	50	Solution	30.32	97582	41275.00	57.70
t500m50r3-3.pl.json	500	50	Solution	34.67	98223	45600.00	53.58
t500m50r3-4.pl.json	500	50	Solution	30.50	97899	43554.00	55.51
t500m50r3-5.pl.json	500	50	Solution	30.33	98115	44963.00	54.17
t500m50r3-6.pl.json	500	50	Solution	30.31	97331	38374.00	60.57
t500m50r3-7.pl.json	500	50	Solution	30.30	96331	41410.00	57.01
t500m50r3-8.pl.json	500	50	Solution	30.35	97725	46945.00	51.96
t500m50r3-9.pl.json	500	50	Solution	30.28	97526	45689.00	53.15
t500m50r5-1.pl.json	500	50	Solution	30.27	97780	43579.00	55.43
t500m50r5-10.pl.json	500	50	Solution	30.31	97631	41522.00	57.47
t500m50r5-11.pl.json	500	50	Solution	34.24	97571	40447.00	58.55
t500m50r5-12.pl.json	500	50	Solution	30.34	97678	41246.00	57.77
t500m50r5-13.pl.json	500	50	Solution	30.28	97497	37668.00	61.36
t500m50r5-14.pl.json	500	50	Solution	30.29	99505	37897.00	61.91
t500m50r5-15.pl.json	500	50	Solution	30.45	97382	44019.00	54.80
t500m50r5-16.pl.json	500	50	Solution	30.28	97763	41798.00	57.25
t500m50r5-17.pl.json	500	50	Solution	30.32	96938	36155.00	62.70
t500m50r5-18.pl.json	500	50	Solution	30.26	97819	33100.00	66.16

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t500m50r5-19.pl.json	500	50	Solution	34.56	97278	36464.00	62.52
t500m50r5-2.pl.json	500	50	Solution	30.29	96060	40840.00	57.48
t500m50r5-20.pl.json	500	50	Solution	34.18	98245	41452.00	57.81
t500m50r5-3.pl.json	500	50	Solution	30.49	99069	37737.00	61.91
t500m50r5-4.pl.json	500	50	Solution	30.26	98094	33092.00	66.27
t500m50r5-5.pl.json	500	50	Solution	30.35	97837	33529.00	65.73
t500m50r5-6.pl.json	500	50	Solution	30.28	97882	39918.00	59.22
t500m50r5-7.pl.json	500	50	Solution	30.30	97935	41726.00	57.39
t500m50r5-8.pl.json	500	50	Solution	30.28	96977	34249.00	64.68
t500m50r5-9.pl.json	500	50	Solution	30.27	96065	30499.00	68.25
t50m10r10-1.pl.json	50	10	Solution	30.04	6499	5840.00	10.14
t50m10r10-10.pl.json	50	10	Optimal	6.15	3396	3396.00	0.00
t50m10r10-11.pl.json	50	10	Optimal	7.37	3398	3398.00	0.00
t50m10r10-12.pl.json	50	10	Solution	30.04	7550	6544.00	13.32
t50m10r10-13.pl.json	50	10	Optimal	16.73	5484	5484.00	0.00
t50m10r10-14.pl.json	50	10	Solution	30.03	4666	3431.00	26.47
t50m10r10-15.pl.json	50	10	Solution	30.03	6640	5903.00	11.10
t50m10r10-16.pl.json	50	10	Optimal	21.47	4914	4914.00	0.00
t50m10r10-17.pl.json	50	10	Optimal	0.60	2252	2252.00	0.00
t50m10r10-18.pl.json	50	10	Solution	30.04	4034	3841.00	4.78
t50m10r10-19.pl.json	50	10	Solution	30.04	4873	4532.00	7.00
t50m10r10-2.pl.json	50	10	Solution	30.02	4148	3646.00	12.10
t50m10r10-20.pl.json	50	10	Optimal	0.38	3158	3158.00	0.00
t50m10r10-3.pl.json	50	10	Solution	30.04	4334	4190.00	3.32
t50m10r10-4.pl.json	50	10	Solution	30.01	4259	3715.00	12.77
t50m10r10-5.pl.json	50	10	Optimal	5.78	2211	2211.00	0.00
t50m10r10-6.pl.json	50	10	Solution	30.04	5752	5457.00	5.13
t50m10r10-7.pl.json	50	10	Optimal	10.99	3239	3239.00	0.00
t50m10r10-8.pl.json	50	10	Optimal	0.80	2624	2624.00	0.00
t50m10r10-9.pl.json	50	10	Solution	30.02	5109	5015.00	1.84
t50m10r3-1.pl.json	50	10	Optimal	0.54	7067	7067.00	0.00
t50m10r3-10.pl.json	50	10	Optimal	0.35	4504	4504.00	0.00
t50m10r3-11.pl.json	50	10	Solution	30.03	3856	3811.00	1.17
t50m10r3-12.pl.json	50	10	Optimal	0.35	3063	3063.00	0.00
t50m10r3-13.pl.json	50	10	Optimal	0.22	5368	5368.00	0.00
t50m10r3-14.pl.json	50	10	Optimal	0.22	5759	5759.00	0.00
t50m10r3-15.pl.json	50	10	Optimal	1.89	6360	6360.00	0.00
t50m10r3-16.pl.json	50	10	Optimal	0.54	7616	7616.00	0.00
t50m10r3-17.pl.json	50	10	Solution	30.03	5429	5233.00	3.61
t50m10r3-18.pl.json	50	10	Optimal	0.94	5186	5186.00	0.00
t50m10r3-19.pl.json	50	10	Optimal	0.48	4197	4197.00	0.00
t50m10r3-2.pl.json	50	10	Optimal	0.43	5680	5680.00	0.00
t50m10r3-20.pl.json	50	10	Optimal	0.44	7792	7792.00	0.00
t50m10r3-3.pl.json	50	10	Optimal	0.79	3752	3752.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t50m10r3-4.pl.json	50	10	Optimal	0.66	4942	4942.00	0.00
t50m10r3-5.pl.json	50	10	Optimal	0.44	6159	6159.00	0.00
t50m10r3-6.pl.json	50	10	Optimal	0.52	3804	3804.00	0.00
t50m10r3-7.pl.json	50	10	Optimal	0.16	6186	6186.00	0.00
t50m10r3-8.pl.json	50	10	Optimal	0.71	5142	5142.00	0.00
t50m10r3-9.pl.json	50	10	Solution	30.02	7279	7191.00	1.21
t50m10r5-1.pl.json	50	10	Optimal	0.68	5397	5397.00	0.00
t50m10r5-10.pl.json	50	10	Optimal	0.26	4926	4926.00	0.00
t50m10r5-11.pl.json	50	10	Optimal	0.54	3620	3620.00	0.00
t50m10r5-12.pl.json	50	10	Optimal	0.26	5183	5183.00	0.00
t50m10r5-13.pl.json	50	10	Solution	30.03	5716	5394.00	5.63
t50m10r5-14.pl.json	50	10	Optimal	0.60	2828	2828.00	0.00
t50m10r5-15.pl.json	50	10	Solution	30.01	6385	6283.00	1.60
t50m10r5-16.pl.json	50	10	Solution	30.04	4548	3970.00	12.71
t50m10r5-17.pl.json	50	10	Optimal	0.33	5129	5129.00	0.00
t50m10r5-18.pl.json	50	10	Solution	30.02	5831	5303.00	9.06
t50m10r5-19.pl.json	50	10	Solution	30.04	5552	5213.00	6.11
t50m10r5-2.pl.json	50	10	Optimal	0.33	5153	5153.00	0.00
t50m10r5-20.pl.json	50	10	Optimal	9.30	3900	3900.00	0.00
t50m10r5-3.pl.json	50	10	Solution	30.03	4708	4667.00	0.87
t50m10r5-4.pl.json	50	10	Solution	30.02	5551	4986.00	10.18
t50m10r5-5.pl.json	50	10	Optimal	0.31	7451	7451.00	0.00
t50m10r5-6.pl.json	50	10	Optimal	0.53	3781	3781.00	0.00
t50m10r5-7.pl.json	50	10	Optimal	17.68	3323	3323.00	0.00
t50m10r5-8.pl.json	50	10	Solution	30.02	5559	4986.00	10.31
t50m10r5-9.pl.json	50	10	Solution	30.02	6385	6082.00	4.75
t50m20r10-1.pl.json	50	20	Solution	30.04	5211	4457.00	14.47
t50m20r10-10.pl.json	50	20	Optimal	0.59	7934	7934.00	0.00
t50m20r10-11.pl.json	50	20	Optimal	21.37	5509	5509.00	0.00
t50m20r10-12.pl.json	50	20	Solution	30.04	5023	4256.00	15.27
t50m20r10-13.pl.json	50	20	Optimal	0.36	4143	4143.00	0.00
t50m20r10-14.pl.json	50	20	Optimal	0.43	6048	6048.00	0.00
t50m20r10-15.pl.json	50	20	Solution	30.03	5992	5301.00	11.53
t50m20r10-16.pl.json	50	20	Optimal	0.66	5032	5032.00	0.00
t50m20r10-17.pl.json	50	20	Optimal	0.40	4488	4488.00	0.00
t50m20r10-18.pl.json	50	20	Solution	30.02	4848	4599.00	5.14
t50m20r10-19.pl.json	50	20	Solution	30.03	5430	4555.00	16.11
t50m20r10-2.pl.json	50	20	Solution	30.03	6192	5348.00	13.63
t50m20r10-20.pl.json	50	20	Solution	30.03	6271	5680.00	9.42
t50m20r10-3.pl.json	50	20	Solution	30.03	6582	6278.00	4.62
t50m20r10-4.pl.json	50	20	Solution	30.03	5686	5160.00	9.25
t50m20r10-5.pl.json	50	20	Optimal	0.37	3301	3301.00	0.00
t50m20r10-6.pl.json	50	20	Optimal	20.69	4425	4425.00	0.00
t50m20r10-7.pl.json	50	20	Optimal	1.52	3519	3519.00	0.00

Table 7.2: Results for Test Scheduling Problems (CPSat) (840 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
t50m20r10-8.pl.json	50	20	Solution	30.02	4630	4569.00	1.32
t50m20r10-9.pl.json	50	20	Solution	30.05	5869	5303.00	9.64
t50m20r3-1.pl.json	50	20	Optimal	0.26	3869	3869.00	0.00
t50m20r3-10.pl.json	50	20	Optimal	0.33	3982	3982.00	0.00
t50m20r3-11.pl.json	50	20	Optimal	0.38	4144	4144.00	0.00
t50m20r3-12.pl.json	50	20	Optimal	0.39	2791	2791.00	0.00
t50m20r3-13.pl.json	50	20	Optimal	1.02	6449	6449.00	0.00
t50m20r3-14.pl.json	50	20	Optimal	0.36	4933	4933.00	0.00
t50m20r3-15.pl.json	50	20	Optimal	22.87	2436	2436.00	0.00
t50m20r3-16.pl.json	50	20	Optimal	0.19	5872	5872.00	0.00
t50m20r3-17.pl.json	50	20	Optimal	0.54	6880	6880.00	0.00
t50m20r3-18.pl.json	50	20	Optimal	0.32	2811	2811.00	0.00
t50m20r3-19.pl.json	50	20	Optimal	0.44	3465	3465.00	0.00
t50m20r3-2.pl.json	50	20	Optimal	0.38	5570	5570.00	0.00
t50m20r3-20.pl.json	50	20	Optimal	0.44	6364	6364.00	0.00
t50m20r3-3.pl.json	50	20	Optimal	0.51	3081	3081.00	0.00
t50m20r3-4.pl.json	50	20	Optimal	0.43	3505	3505.00	0.00
t50m20r3-5.pl.json	50	20	Optimal	0.44	2228	2228.00	0.00
t50m20r3-6.pl.json	50	20	Optimal	0.82	5713	5713.00	0.00
t50m20r3-7.pl.json	50	20	Optimal	0.74	3173	3173.00	0.00
t50m20r3-8.pl.json	50	20	Optimal	14.05	3908	3908.00	0.00
t50m20r3-9.pl.json	50	20	Optimal	0.44	4661	4661.00	0.00
t50m20r5-1.pl.json	50	20	Solution	30.04	6273	5304.00	15.45
t50m20r5-10.pl.json	50	20	Optimal	0.55	2328	2328.00	0.00
t50m20r5-11.pl.json	50	20	Optimal	1.81	6403	6403.00	0.00
t50m20r5-12.pl.json	50	20	Optimal	1.21	4281	4281.00	0.00
t50m20r5-13.pl.json	50	20	Optimal	0.58	5754	5754.00	0.00
t50m20r5-14.pl.json	50	20	Solution	30.03	6639	5359.00	19.28
t50m20r5-15.pl.json	50	20	Optimal	0.41	3472	3472.00	0.00
t50m20r5-16.pl.json	50	20	Solution	30.04	5934	5042.00	15.03
t50m20r5-17.pl.json	50	20	Optimal	0.28	4745	4745.00	0.00
t50m20r5-18.pl.json	50	20	Optimal	0.31	3147	3147.00	0.00
t50m20r5-19.pl.json	50	20	Optimal	0.65	5960	5960.00	0.00
t50m20r5-2.pl.json	50	20	Solution	30.03	5547	5417.00	2.34
t50m20r5-20.pl.json	50	20	Optimal	0.30	3913	3913.00	0.00
t50m20r5-3.pl.json	50	20	Solution	30.04	5598	4754.00	15.08
t50m20r5-4.pl.json	50	20	Solution	30.03	5367	4465.00	16.81
t50m20r5-5.pl.json	50	20	Optimal	1.74	3648	3648.00	0.00
t50m20r5-6.pl.json	50	20	Optimal	0.38	5449	5449.00	0.00
t50m20r5-7.pl.json	50	20	Solution	30.04	4127	3794.00	8.07
t50m20r5-8.pl.json	50	20	Solution	30.05	5003	4535.00	9.35
t50m20r5-9.pl.json	50	20	Optimal	0.40	4022	4022.00	0.00

Chapter 8

J&J Hybrid Flexible Flowshop with Transportation Times

8.1 Without Transportation Times

8.1.1 Results for CPOptimizer

Table 8.1: Results for Factory Design (CPO) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance100 1.txt	100	80	Solution	300.32	98	56.00	42.86
instance100 10.txt	100	80	Solution	300.23	97	63.00	35.05
instance100 11.txt	100	80	Solution	300.37	97	69.00	28.87
instance100 12.txt	100	80	Solution	300.26	98	60.00	38.78
instance100 13.txt	100	80	Solution	300.26	102	58.00	43.14
instance100 14.txt	100	80	Solution	300.17	106	59.00	44.34
instance100 15.txt	100	80	Solution	300.21	97	59.00	39.18
instance100 16.txt	100	80	Solution	300.24	98	58.00	40.82
instance100 17.txt	100	80	Solution	300.21	94	70.00	25.53
instance100 18.txt	100	80	Solution	300.22	100	60.00	40.00
instance100 19.txt	100	80	Solution	300.16	96	59.00	38.54
instance100 2.txt	100	80	Solution	300.20	97	58.00	40.21
instance100 20.txt	100	80	Solution	300.21	98	56.00	42.86
instance100 21.txt	100	80	Solution	300.22	99	67.00	32.32
instance100 22.txt	100	80	Solution	300.26	94	57.00	39.36
instance100 23.txt	100	80	Solution	300.23	97	59.00	39.18
instance100 24.txt	100	80	Solution	300.21	104	69.00	33.65
instance100 25.txt	100	80	Solution	300.21	100	59.00	41.00
instance100 3.txt	100	80	Solution	300.23	92	53.00	42.39
instance100 4.txt	100	80	Solution	300.24	94	61.00	35.11

Table 8.1: Results for Factory Design (CPO) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance100 5.txt	100	80	Solution	300.22	102	58.00	43.14
instance100 6.txt	100	80	Solution	300.23	110	64.00	41.82
instance100 7.txt	100	80	Solution	300.24	101	64.00	36.63
instance100 8.txt	100	80	Solution	300.20	101	55.00	45.54
instance100 9.txt	100	80	Solution	300.19	100	65.00	35.00
instance200 1.txt	200	80	Solution	300.33	168	62.00	63.10
instance200 10.txt	200	80	Solution	300.23	157	63.00	59.87
instance200 11.txt	200	80	Solution	300.26	156	64.00	58.97
instance200 12.txt	200	80	Solution	300.17	164	65.00	60.37
instance200 13.txt	200	80	Solution	300.17	158	61.00	61.39
instance200 14.txt	200	80	Solution	300.27	182	65.00	64.29
instance200 15.txt	200	80	Solution	300.18	157	59.00	62.42
instance200 16.txt	200	80	Solution	300.29	151	67.00	55.63
instance200 17.txt	200	80	Solution	300.21	151	62.00	58.94
instance200 18.txt	200	80	Solution	300.29	171	64.00	62.57
instance200 19.txt	200	80	Solution	300.20	160	58.00	63.75
instance200 2.txt	200	80	Solution	300.22	162	63.00	61.11
instance200 20.txt	200	80	Solution	300.19	161	68.00	57.76
instance200 21.txt	200	80	Solution	300.22	163	67.00	58.90
instance200 22.txt	200	80	Solution	300.24	155	57.00	63.23
instance200 23.txt	200	80	Solution	300.24	146	62.00	57.53
instance200 24.txt	200	80	Solution	300.25	173	69.00	60.12
instance200 25.txt	200	80	Solution	300.28	167	65.00	61.08
instance200 3.txt	200	80	Solution	300.20	153	64.00	58.17
instance200 4.txt	200	80	Solution	300.21	161	68.00	57.76
instance200 5.txt	200	80	Solution	300.19	164	61.00	62.80
instance200 6.txt	200	80	Solution	300.20	164	66.00	59.76
instance200 7.txt	200	80	Solution	300.21	161	64.00	60.25
instance200 8.txt	200	80	Solution	300.23	164	58.00	64.63
instance200 9.txt	200	80	Solution	300.22	166	65.00	60.84
instance20 1.txt	20	80	Optimal	0.60	55	55.00	0.00
instance20 10.txt	20	80	Optimal	0.46	53	53.00	0.00
instance20 11.txt	20	80	Optimal	0.45	61	61.00	0.00
instance20 12.txt	20	80	Optimal	0.48	56	56.00	0.00
instance20 13.txt	20	80	Optimal	0.45	61	61.00	0.00
instance20 14.txt	20	80	Solution	300.06	54	53.00	1.85
instance20 15.txt	20	80	Solution	300.04	49	45.00	8.16
instance20 16.txt	20	80	Optimal	0.42	52	52.00	0.00
instance20 17.txt	20	80	Optimal	0.41	53	53.00	0.00
instance20 18.txt	20	80	Optimal	0.38	56	56.00	0.00
instance20 19.txt	20	80	Optimal	0.44	56	56.00	0.00
instance20 2.txt	20	80	Optimal	0.57	53	53.00	0.00
instance20 20.txt	20	80	Optimal	0.43	55	55.00	0.00
instance20 21.txt	20	80	Optimal	0.46	58	58.00	0.00
instance20 22.txt	20	80	Optimal	10.34	56	56.00	0.00

Table 8.1: Results for Factory Design (CPO) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance20 23.txt	20	80	Optimal	0.46	47	47.00	0.00
instance20 24.txt	20	80	Optimal	0.47	59	59.00	0.00
instance20 25.txt	20	80	Optimal	0.49	59	59.00	0.00
instance20 3.txt	20	80	Optimal	0.53	51	51.00	0.00
instance20 4.txt	20	80	Solution	300.03	50	49.00	2.00
instance20 5.txt	20	80	Solution	300.09	56	55.00	1.79
instance20 6.txt	20	80	Solution	300.06	56	52.00	7.14
instance20 7.txt	20	80	Optimal	0.53	61	61.00	0.00
instance20 8.txt	20	80	Solution	300.07	52	51.00	1.92
instance20 9.txt	20	80	Optimal	0.53	65	65.00	0.00
instance25 1.txt	25	80	Optimal	2.44	55	55.00	0.00
instance25 10.txt	25	80	Optimal	7.90	53	53.00	0.00
instance25 11.txt	25	80	Solution	300.16	50	48.00	4.00
instance25 12.txt	25	80	Optimal	2.54	56	56.00	0.00
instance25 13.txt	25	80	Optimal	2.38	61	61.00	0.00
instance25 14.txt	25	80	Solution	300.21	57	53.00	7.02
instance25 15.txt	25	80	Optimal	2.87	54	54.00	0.00
instance25 16.txt	25	80	Solution	300.25	52	50.00	3.85
instance25 17.txt	25	80	Optimal	2.45	55	55.00	0.00
instance25 18.txt	25	80	Optimal	3.63	54	54.00	0.00
instance25 19.txt	25	80	Optimal	2.47	54	54.00	0.00
instance25 2.txt	25	80	Optimal	2.52	57	57.00	0.00
instance25 20.txt	25	80	Optimal	7.99	56	56.00	0.00
instance25 21.txt	25	80	Optimal	2.53	62	62.00	0.00
instance25 22.txt	25	80	Optimal	5.65	56	56.00	0.00
instance25 23.txt	25	80	Optimal	2.56	54	54.00	0.00
instance25 24.txt	25	80	Optimal	2.36	59	59.00	0.00
instance25 25.txt	25	80	Optimal	5.20	59	59.00	0.00
instance25 3.txt	25	80	Optimal	6.11	52	52.00	0.00
instance25 4.txt	25	80	Solution	300.21	53	49.00	7.55
instance25 5.txt	25	80	Solution	300.16	57	52.00	8.77
instance25 6.txt	25	80	Optimal	4.18	64	64.00	0.00
instance25 7.txt	25	80	Optimal	2.42	64	64.00	0.00
instance25 8.txt	25	80	Optimal	2.56	55	55.00	0.00
instance25 9.txt	25	80	Optimal	2.45	65	65.00	0.00
instance300 1.txt	300	80	Solution	300.33	235	61.00	74.04
instance300 10.txt	300	80	Solution	300.37	220	63.00	71.36
instance300 11.txt	300	80	Solution	300.30	216	69.00	68.06
instance300 12.txt	300	80	Solution	300.32	223	63.00	71.75
instance300 13.txt	300	80	Solution	300.26	229	65.00	71.62
instance300 14.txt	300	80	Solution	300.29	243	65.00	73.25
instance300 15.txt	300	80	Solution	300.40	215	60.00	72.09
instance300 16.txt	300	80	Solution	300.35	210	62.00	70.48
instance300 17.txt	300	80	Solution	300.39	223	62.00	72.20
instance300 18.txt	300	80	Solution	300.37	241	62.00	74.27

Table 8.1: Results for Factory Design (CPO) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance300 19.txt	300	80	Solution	300.32	232	65.00	71.98
instance300 2.txt	300	80	Solution	300.35	220	59.00	73.18
instance300 20.txt	300	80	Solution	300.31	225	64.00	71.56
instance300 21.txt	300	80	Solution	300.35	228	65.00	71.49
instance300 22.txt	300	80	Solution	300.31	220	58.00	73.64
instance300 23.txt	300	80	Solution	300.29	203	63.00	68.97
instance300 24.txt	300	80	Solution	300.25	233	69.00	70.39
instance300 25.txt	300	80	Solution	300.37	235	65.00	72.34
instance300 3.txt	300	80	Solution	300.27	233	67.00	71.24
instance300 4.txt	300	80	Solution	300.29	228	68.00	70.18
instance300 5.txt	300	80	Solution	300.36	231	63.00	72.73
instance300 6.txt	300	80	Solution	300.45	235	66.00	71.91
instance300 7.txt	300	80	Solution	300.34	222	64.00	71.17
instance300 8.txt	300	80	Solution	300.28	235	63.00	73.19
instance300 9.txt	300	80	Solution	300.36	236	65.00	72.46
instance30 1.txt	30	80	Optimal	23.19	56	56.00	0.00
instance30 10.txt	30	80	Optimal	9.12	63	63.00	0.00
instance30 11.txt	30	80	Solution	300.45	52	51.00	1.92
instance30 12.txt	30	80	Optimal	4.35	56	56.00	0.00
instance30 13.txt	30	80	Optimal	4.59	61	61.00	0.00
instance30 14.txt	30	80	Solution	300.38	60	59.00	1.67
instance30 15.txt	30	80	Solution	300.42	55	54.00	1.82
instance30 16.txt	30	80	Optimal	6.94	55	55.00	0.00
instance30 17.txt	30	80	Optimal	4.55	55	55.00	0.00
instance30 18.txt	30	80	Optimal	3.89	61	61.00	0.00
instance30 19.txt	30	80	Optimal	4.48	56	56.00	0.00
instance30 2.txt	30	80	Optimal	44.83	56	56.00	0.00
instance30 20.txt	30	80	Solution	300.96	57	53.00	7.02
instance30 21.txt	30	80	Optimal	4.30	62	62.00	0.00
instance30 22.txt	30	80	Solution	300.17	58	56.00	3.45
instance30 23.txt	30	80	Optimal	7.11	54	54.00	0.00
instance30 24.txt	30	80	Optimal	66.57	61	61.00	0.00
instance30 25.txt	30	80	Solution	300.55	60	59.00	1.67
instance30 3.txt	30	80	Solution	300.20	54	52.00	3.70
instance30 4.txt	30	80	Solution	300.32	56	49.00	12.50
instance30 5.txt	30	80	Solution	300.18	62	55.00	11.29
instance30 6.txt	30	80	Optimal	72.28	64	64.00	0.00
instance30 7.txt	30	80	Optimal	4.74	61	61.00	0.00
instance30 8.txt	30	80	Solution	300.24	57	54.00	5.26
instance30 9.txt	30	80	Optimal	5.81	65	65.00	0.00
instance400 1.txt	400	80	Solution	300.47	288	59.00	79.51
instance400 10.txt	400	80	Solution	300.39	286	64.00	77.62
instance400 11.txt	400	80	Solution	300.48	269	62.00	76.95
instance400 12.txt	400	80	Solution	300.44	290	65.00	77.59
instance400 13.txt	400	80	Solution	300.55	280	61.00	78.21

Table 8.1: Results for Factory Design (CPO) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance400 14.txt	400	80	Solution	300.55	315	60.00	80.95
instance400 15.txt	400	80	Solution	300.41	287	62.00	78.40
instance400 16.txt	400	80	Solution	300.38	270	62.00	77.04
instance400 17.txt	400	80	Solution	300.36	279	70.00	74.91
instance400 18.txt	400	80	Solution	300.32	304	64.00	78.95
instance400 19.txt	400	80	Solution	300.37	300	65.00	78.33
instance400 2.txt	400	80	Solution	300.39	289	64.00	77.85
instance400 20.txt	400	80	Solution	300.38	289	66.00	77.16
instance400 21.txt	400	80	Solution	300.47	292	67.00	77.05
instance400 22.txt	400	80	Solution	300.47	272	59.00	78.31
instance400 23.txt	400	80	Solution	300.35	269	66.00	75.46
instance400 24.txt	400	80	Solution	300.34	303	65.00	78.55
instance400 25.txt	400	80	Solution	300.40	294	65.00	77.89
instance400 3.txt	400	80	Solution	300.45	283	66.00	76.68
instance400 4.txt	400	80	Solution	300.35	296	68.00	77.03
instance400 5.txt	400	80	Solution	300.44	292	58.00	80.14
instance400 6.txt	400	80	Solution	300.49	297	66.00	77.78
instance400 7.txt	400	80	Solution	300.55	289	64.00	77.85
instance400 8.txt	400	80	Solution	300.34	299	64.00	78.60
instance400 9.txt	400	80	Solution	300.41	291	65.00	77.66
instance40 1.txt	40	80	Solution	300.09	61	56.00	8.20
instance40 10.txt	40	80	Solution	300.11	62	53.00	14.52
instance40 11.txt	40	80	Solution	300.34	59	54.00	8.47
instance40 12.txt	40	80	Solution	300.19	58	54.00	6.90
instance40 13.txt	40	80	Solution	300.23	62	57.00	8.06
instance40 14.txt	40	80	Solution	300.23	64	59.00	7.81
instance40 15.txt	40	80	Solution	300.19	60	48.00	20.00
instance40 16.txt	40	80	Solution	300.36	59	58.00	1.69
instance40 17.txt	40	80	Solution	300.32	57	55.00	3.51
instance40 18.txt	40	80	Solution	300.17	62	56.00	9.68
instance40 19.txt	40	80	Optimal	2.62	62	62.00	0.00
instance40 2.txt	40	80	Solution	300.15	64	58.00	9.38
instance40 20.txt	40	80	Solution	300.15	63	55.00	12.70
instance40 21.txt	40	80	Optimal	4.47	65	65.00	0.00
instance40 22.txt	40	80	Solution	300.41	58	56.00	3.45
instance40 23.txt	40	80	Optimal	44.64	56	56.00	0.00
instance40 24.txt	40	80	Solution	300.30	67	61.00	8.96
instance40 25.txt	40	80	Solution	300.08	67	65.00	2.99
instance40 3.txt	40	80	Solution	300.06	54	53.00	1.85
instance40 4.txt	40	80	Solution	300.30	60	51.00	15.00
instance40 5.txt	40	80	Solution	300.16	63	58.00	7.94
instance40 6.txt	40	80	Solution	300.15	66	64.00	3.03
instance40 7.txt	40	80	Optimal	18.16	61	61.00	0.00
instance40 8.txt	40	80	Solution	300.32	60	55.00	8.33
instance40 9.txt	40	80	Optimal	5.42	65	65.00	0.00

Table 8.1: Results for Factory Design (CPO) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance50 1.txt	50	80	Solution	300.17	65	56.00	13.85
instance50 10.txt	50	80	Solution	300.32	65	53.00	18.46
instance50 11.txt	50	80	Solution	300.35	66	61.00	7.58
instance50 12.txt	50	80	Solution	300.24	63	57.00	9.52
instance50 13.txt	50	80	Solution	300.16	67	58.00	13.43
instance50 14.txt	50	80	Solution	300.13	70	59.00	15.71
instance50 15.txt	50	80	Solution	300.14	66	55.00	16.67
instance50 16.txt	50	80	Solution	300.35	64	56.00	12.50
instance50 17.txt	50	80	Solution	300.12	61	55.00	9.84
instance50 18.txt	50	80	Solution	300.27	70	64.00	8.57
instance50 19.txt	50	80	Solution	300.24	62	54.00	12.90
instance50 2.txt	50	80	Solution	300.12	68	58.00	14.71
instance50 20.txt	50	80	Solution	300.27	68	54.00	20.59
instance50 21.txt	50	80	Optimal	177.71	67	67.00	0.00
instance50 22.txt	50	80	Solution	300.32	65	56.00	13.85
instance50 23.txt	50	80	Solution	300.10	63	54.00	14.29
instance50 24.txt	50	80	Solution	300.13	72	65.00	9.72
instance50 25.txt	50	80	Solution	300.54	71	59.00	16.90
instance50 3.txt	50	80	Solution	300.09	62	58.00	6.45
instance50 4.txt	50	80	Solution	300.13	66	54.00	18.18
instance50 5.txt	50	80	Solution	300.21	69	58.00	15.94
instance50 6.txt	50	80	Solution	300.46	71	64.00	9.86
instance50 7.txt	50	80	Solution	300.20	68	64.00	5.88
instance50 8.txt	50	80	Solution	300.13	65	54.00	16.92
instance50 9.txt	50	80	Solution	300.11	71	65.00	8.45

8.1.2 Results for CPSat

Table 8.2: Results for Factory Design (CPSat) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance100 1.txt	100	80	Solution	300.37	112	56.00	50.00
instance100 10.txt	100	80	Solution	300.46	120	63.00	47.50
instance100 11.txt	100	80	Solution	300.43	124	69.00	44.35
instance100 12.txt	100	80	Solution	300.52	120	60.00	50.00
instance100 13.txt	100	80	Solution	300.45	116	58.00	50.00
instance100 14.txt	100	80	Solution	300.44	121	59.00	51.24
instance100 15.txt	100	80	Solution	300.43	113	59.00	47.79
instance100 16.txt	100	80	Solution	300.46	111	58.00	47.75
instance100 17.txt	100	80	Solution	300.45	116	70.00	39.66
instance100 18.txt	100	80	Solution	300.45	119	60.00	49.58
instance100 19.txt	100	80	Solution	300.45	109	59.00	45.87

Table 8.2: Results for Factory Design (CPSat) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance100 2.txt	100	80	Solution	300.44	121	58.00	52.07
instance100 20.txt	100	80	Solution	300.45	132	56.00	57.58
instance100 21.txt	100	80	Solution	300.45	116	67.00	42.24
instance100 22.txt	100	80	Solution	300.45	118	57.00	51.69
instance100 23.txt	100	80	Solution	300.45	114	59.00	48.25
instance100 24.txt	100	80	Solution	300.48	121	69.00	42.98
instance100 25.txt	100	80	Solution	300.49	125	59.00	52.80
instance100 3.txt	100	80	Solution	300.45	115	53.00	53.91
instance100 4.txt	100	80	Solution	300.45	113	61.00	46.02
instance100 5.txt	100	80	Solution	300.48	118	58.00	50.85
instance100 6.txt	100	80	Solution	300.47	129	64.00	50.39
instance100 7.txt	100	80	Solution	300.50	122	64.00	47.54
instance100 8.txt	100	80	Solution	300.45	117	55.00	52.99
instance100 9.txt	100	80	Solution	300.48	135	65.00	51.85
instance200 1.txt	200	80	Solution	301.17	528	62.00	88.26
instance200 10.txt	200	80	Solution	301.34	265	63.00	76.23
instance200 11.txt	200	80	Solution	301.34	284	64.00	77.46
instance200 12.txt	200	80	Solution	301.40	458	65.00	85.81
instance200 13.txt	200	80	Solution	301.32	330	61.00	81.52
instance200 14.txt	200	80	Solution	301.33	217	65.00	70.05
instance200 15.txt	200	80	Solution	301.31	195	59.00	69.74
instance200 16.txt	200	80	Solution	301.32	218	67.00	69.27
instance200 17.txt	200	80	Solution	301.33	195	62.00	68.21
instance200 18.txt	200	80	Solution	301.27	240	64.00	73.33
instance200 19.txt	200	80	Solution	301.35	192	58.00	69.79
instance200 2.txt	200	80	Solution	301.41	205	63.00	69.27
instance200 20.txt	200	80	Solution	301.41	325	68.00	79.08
instance200 21.txt	200	80	Solution	301.45	413	67.00	83.78
instance200 22.txt	200	80	Solution	301.45	426	57.00	86.62
instance200 23.txt	200	80	Solution	301.48	187	62.00	66.84
instance200 24.txt	200	80	Solution	301.40	327	69.00	78.90
instance200 25.txt	200	80	Solution	301.46	269	65.00	75.84
instance200 3.txt	200	80	Solution	301.52	483	64.00	86.75
instance200 4.txt	200	80	Solution	301.58	435	68.00	84.37
instance200 5.txt	200	80	Solution	301.45	263	61.00	76.81
instance200 6.txt	200	80	Solution	301.48	470	66.00	85.96
instance200 7.txt	200	80	Solution	301.51	258	64.00	75.19
instance200 8.txt	200	80	Solution	301.46	213	58.00	72.77
instance200 9.txt	200	80	Solution	301.46	214	65.00	69.63
instance20 1.txt	20	80	Optimal	2.47	55	55.00	0.00
instance20 10.txt	20	80	Optimal	2.61	53	53.00	0.00
instance20 11.txt	20	80	Optimal	1.74	61	61.00	0.00
instance20 12.txt	20	80	Optimal	2.48	56	56.00	0.00
instance20 13.txt	20	80	Optimal	1.47	61	61.00	0.00
instance20 14.txt	20	80	Optimal	52.64	54	54.00	0.00

Table 8.2: Results for Factory Design (CPSat) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance20 15.txt	20	80	Optimal	10.57	49	49.00	0.00
instance20 16.txt	20	80	Optimal	2.97	52	52.00	0.00
instance20 17.txt	20	80	Optimal	4.02	53	53.00	0.00
instance20 18.txt	20	80	Optimal	1.89	56	56.00	0.00
instance20 19.txt	20	80	Optimal	2.43	56	56.00	0.00
instance20 2.txt	20	80	Optimal	4.55	53	53.00	0.00
instance20 20.txt	20	80	Optimal	4.03	55	55.00	0.00
instance20 21.txt	20	80	Optimal	2.20	58	58.00	0.00
instance20 22.txt	20	80	Optimal	56.65	56	56.00	0.00
instance20 23.txt	20	80	Optimal	4.08	47	47.00	0.00
instance20 24.txt	20	80	Optimal	2.76	59	59.00	0.00
instance20 25.txt	20	80	Optimal	3.67	59	59.00	0.00
instance20 3.txt	20	80	Optimal	2.44	51	51.00	0.00
instance20 4.txt	20	80	Solution	300.15	50	49.00	2.00
instance20 5.txt	20	80	Optimal	18.43	56	56.00	0.00
instance20 6.txt	20	80	Optimal	42.43	56	56.00	0.00
instance20 7.txt	20	80	Optimal	3.56	61	61.00	0.00
instance20 8.txt	20	80	Optimal	27.78	52	52.00	0.00
instance20 9.txt	20	80	Optimal	3.64	65	65.00	0.00
instance25 1.txt	25	80	Optimal	5.30	55	55.00	0.00
instance25 10.txt	25	80	Optimal	24.74	53	53.00	0.00
instance25 11.txt	25	80	Solution	300.19	51	48.00	5.88
instance25 12.txt	25	80	Optimal	3.97	56	56.00	0.00
instance25 13.txt	25	80	Optimal	3.15	61	61.00	0.00
instance25 14.txt	25	80	Optimal	63.01	57	57.00	0.00
instance25 15.txt	25	80	Optimal	4.26	54	54.00	0.00
instance25 16.txt	25	80	Optimal	26.97	52	52.00	0.00
instance25 17.txt	25	80	Optimal	4.45	55	55.00	0.00
instance25 18.txt	25	80	Optimal	6.77	54	54.00	0.00
instance25 19.txt	25	80	Optimal	4.64	54	54.00	0.00
instance25 2.txt	25	80	Optimal	4.21	57	57.00	0.00
instance25 20.txt	25	80	Optimal	32.34	56	56.00	0.00
instance25 21.txt	25	80	Optimal	3.50	62	62.00	0.00
instance25 22.txt	25	80	Optimal	26.08	56	56.00	0.00
instance25 23.txt	25	80	Optimal	3.14	54	54.00	0.00
instance25 24.txt	25	80	Optimal	12.90	59	59.00	0.00
instance25 25.txt	25	80	Optimal	8.21	59	59.00	0.00
instance25 3.txt	25	80	Optimal	6.47	52	52.00	0.00
instance25 4.txt	25	80	Solution	300.17	53	49.00	7.55
instance25 5.txt	25	80	Solution	300.16	57	52.00	8.77
instance25 6.txt	25	80	Optimal	3.00	64	64.00	0.00
instance25 7.txt	25	80	Optimal	4.96	64	64.00	0.00
instance25 8.txt	25	80	Optimal	3.30	55	55.00	0.00
instance25 9.txt	25	80	Optimal	5.98	65	65.00	0.00
instance300 1.txt	300	80	Solution	303.33	549	61.00	88.89

Table 8.2: Results for Factory Design (CPSat) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance300 10.txt	300	80	Solution	303.66	302	63.00	79.14
instance300 11.txt	300	80	Solution	303.60	646	69.00	89.32
instance300 12.txt	300	80	Solution	303.65	935	63.00	93.26
instance300 13.txt	300	80	Solution	303.78	1078	65.00	93.97
instance300 14.txt	300	80	Solution	303.90	635	65.00	89.76
instance300 15.txt	300	80	Solution	304.23	560	60.00	89.29
instance300 16.txt	300	80	Solution	304.09	613	62.00	89.89
instance300 17.txt	300	80	Solution	304.08	284	62.00	78.17
instance300 18.txt	300	80	Solution	303.75	676	62.00	90.83
instance300 19.txt	300	80	Solution	303.98	1185	65.00	94.51
instance300 20.txt	300	80	Solution	304.10	305	64.00	79.02
instance300 21.txt	300	80	Solution	304.00	594	65.00	89.06
instance300 22.txt	300	80	Solution	304.21	620	58.00	90.65
instance300 23.txt	300	80	Solution	304.29	270	63.00	76.67
instance300 24.txt	300	80	Solution	304.65	1127	69.00	93.88
instance300 25.txt	300	80	Solution	304.36	1253	65.00	94.81
instance300 3.txt	300	80	Solution	304.31	316	67.00	78.80
instance300 4.txt	300	80	Solution	304.28	306	68.00	77.78
instance300 5.txt	300	80	Solution	304.65	295	63.00	78.64
instance300 6.txt	300	80	Solution	304.51	313	66.00	78.91
instance300 7.txt	300	80	Solution	304.69	644	64.00	90.06
instance300 8.txt	300	80	Solution	304.61	303	63.00	79.21
instance300 9.txt	300	80	Solution	304.87	539	65.00	87.94
instance30 1.txt	30	80	Optimal	42.15	56	56.00	0.00
instance30 10.txt	30	80	Optimal	15.04	63	63.00	0.00
instance30 11.txt	30	80	Solution	300.20	52	51.00	1.92
instance30 12.txt	30	80	Optimal	14.46	56	56.00	0.00
instance30 13.txt	30	80	Optimal	19.35	61	61.00	0.00
instance30 14.txt	30	80	Solution	300.25	61	59.00	3.28
instance30 15.txt	30	80	Optimal	82.53	54	54.00	0.00
instance30 16.txt	30	80	Optimal	15.53	55	55.00	0.00
instance30 17.txt	30	80	Optimal	10.57	55	55.00	0.00
instance30 18.txt	30	80	Optimal	10.27	61	61.00	0.00
instance30 19.txt	30	80	Optimal	27.64	56	56.00	0.00
instance30 2.txt	30	80	Optimal	183.78	56	56.00	0.00
instance30 20.txt	30	80	Solution	300.23	59	53.00	10.17
instance30 21.txt	30	80	Optimal	3.38	62	62.00	0.00
instance30 22.txt	30	80	Solution	300.23	58	56.00	3.45
instance30 23.txt	30	80	Optimal	46.44	54	54.00	0.00
instance30 24.txt	30	80	Optimal	138.38	61	61.00	0.00
instance30 25.txt	30	80	Solution	300.26	60	59.00	1.67
instance30 3.txt	30	80	Solution	300.21	56	52.00	7.14
instance30 4.txt	30	80	Solution	300.21	56	49.00	12.50
instance30 5.txt	30	80	Solution	300.22	62	55.00	11.29
instance30 6.txt	30	80	Optimal	128.19	64	64.00	0.00

Table 8.2: Results for Factory Design (CPSat) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance30 7.txt	30	80	Optimal	13.72	61	61.00	0.00
instance30 8.txt	30	80	Solution	300.20	58	54.00	6.90
instance30 9.txt	30	80	Optimal	34.69	65	65.00	0.00
instance400 1.txt	400	80	Solution	309.66	373	59.00	84.18
instance400 10.txt	400	80	Solution	310.09	876	64.00	92.69
instance400 11.txt	400	80	Solution	310.09	1307	62.00	95.26
instance400 12.txt	400	80	Solution	310.27	390	65.00	83.33
instance400 13.txt	400	80	Solution	310.12	373	61.00	83.65
instance400 14.txt	400	80	Solution	310.27	386	60.00	84.46
instance400 15.txt	400	80	Solution	310.95	952	62.00	93.49
instance400 16.txt	400	80	Solution	311.32	386	62.00	83.94
instance400 17.txt	400	80	Solution	313.04	655	70.00	89.31
instance400 18.txt	400	80	Solution	310.47	855	64.00	92.51
instance400 19.txt	400	80	Solution	314.45	560	65.00	88.39
instance400 2.txt	400	80	Solution	311.52	1102	64.00	94.19
instance400 20.txt	400	80	Solution	314.70	388	66.00	82.99
instance400 21.txt	400	80	Solution	313.19	837	67.00	92.00
instance400 22.txt	400	80	Solution	312.34	992	59.00	94.05
instance400 23.txt	400	80	Solution	313.05	347	66.00	80.98
instance400 24.txt	400	80	Solution	313.85	541	65.00	87.99
instance400 25.txt	400	80	Solution	312.67	945	65.00	93.12
instance400 3.txt	400	80	Solution	312.60	922	66.00	92.84
instance400 4.txt	400	80	Solution	313.19	934	68.00	92.72
instance400 5.txt	400	80	Solution	314.76	1034	58.00	94.39
instance400 6.txt	400	80	Solution	311.64	884	66.00	92.53
instance400 7.txt	400	80	Solution	312.73	911	64.00	92.97
instance400 8.txt	400	80	Solution	313.55	386	64.00	83.42
instance400 9.txt	400	80	Solution	313.53	457	65.00	85.78
instance40 1.txt	40	80	Solution	300.41	62	56.00	9.68
instance40 10.txt	40	80	Solution	300.35	65	53.00	18.46
instance40 11.txt	40	80	Solution	300.36	63	54.00	14.29
instance40 12.txt	40	80	Solution	300.34	60	54.00	10.00
instance40 13.txt	40	80	Solution	300.29	65	57.00	12.31
instance40 14.txt	40	80	Solution	300.32	69	59.00	14.49
instance40 15.txt	40	80	Solution	300.28	62	48.00	22.58
instance40 16.txt	40	80	Solution	300.31	62	58.00	6.45
instance40 17.txt	40	80	Solution	300.29	58	55.00	5.17
instance40 18.txt	40	80	Solution	300.39	64	56.00	12.50
instance40 19.txt	40	80	Optimal	66.89	62	62.00	0.00
instance40 2.txt	40	80	Solution	300.31	67	58.00	13.43
instance40 20.txt	40	80	Solution	300.33	67	55.00	17.91
instance40 21.txt	40	80	Solution	300.30	67	65.00	2.99
instance40 22.txt	40	80	Solution	300.32	62	56.00	9.68
instance40 23.txt	40	80	Solution	300.36	59	56.00	5.08
instance40 24.txt	40	80	Solution	300.37	69	61.00	11.59

Table 8.2: Results for Factory Design (CPSat) (225 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
instance40 25.txt	40	80	Solution	300.36	73	65.00	10.96
instance40 3.txt	40	80	Solution	300.29	57	53.00	7.02
instance40 4.txt	40	80	Solution	300.33	63	51.00	19.05
instance40 5.txt	40	80	Solution	300.35	65	58.00	10.77
instance40 6.txt	40	80	Solution	300.38	70	64.00	8.57
instance40 7.txt	40	80	Solution	300.32	63	61.00	3.17
instance40 8.txt	40	80	Solution	300.34	64	55.00	14.06
instance40 9.txt	40	80	Solution	300.36	66	65.00	1.52
instance50 1.txt	50	80	Solution	300.37	71	56.00	21.13
instance50 10.txt	50	80	Solution	300.41	70	53.00	24.29
instance50 11.txt	50	80	Solution	300.35	71	61.00	14.08
instance50 12.txt	50	80	Solution	300.36	68	57.00	16.18
instance50 13.txt	50	80	Solution	300.46	73	58.00	20.55
instance50 14.txt	50	80	Solution	300.42	76	59.00	22.37
instance50 15.txt	50	80	Solution	300.34	69	55.00	20.29
instance50 16.txt	50	80	Solution	300.36	69	56.00	18.84
instance50 17.txt	50	80	Solution	300.38	65	55.00	15.38
instance50 18.txt	50	80	Solution	300.39	76	64.00	15.79
instance50 19.txt	50	80	Solution	300.35	66	54.00	18.18
instance50 2.txt	50	80	Solution	300.39	73	58.00	20.55
instance50 20.txt	50	80	Solution	300.34	72	54.00	25.00
instance50 21.txt	50	80	Solution	300.38	70	67.00	4.29
instance50 22.txt	50	80	Solution	300.37	69	56.00	18.84
instance50 23.txt	50	80	Solution	300.38	69	54.00	21.74
instance50 24.txt	50	80	Solution	300.35	76	65.00	14.47
instance50 25.txt	50	80	Solution	300.37	77	59.00	23.38
instance50 3.txt	50	80	Solution	300.34	67	58.00	13.43
instance50 4.txt	50	80	Solution	300.42	72	54.00	25.00
instance50 5.txt	50	80	Solution	300.38	77	58.00	24.68
instance50 6.txt	50	80	Solution	300.33	76	64.00	15.79
instance50 7.txt	50	80	Solution	300.37	74	64.00	13.51
instance50 8.txt	50	80	Solution	300.38	72	54.00	25.00
instance50 9.txt	50	80	Solution	300.45	78	65.00	16.67

Chapter 9

RCPSP SingleMode

The detailed result tables for the individual RCPSP instances show that many instances are solved with either solver in less than a second, but that there are a few families of problems which are more difficult to solve. For problem type J30, the sets 13, 29, and 45 are such examples, they are still solved to optimality, but the time required is larger. For bigger problem instances, the solvers are not able to find and prove the optimal solutions for such families, for example sets 9, 13, 25, 29, 41, 45 for j60. It would be interesting to understand this better, and see which generator settings make these instance families more difficult to solve.

9.1 Size J30

9.1.1 CPO

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3010 1.json	1	0	Optimal	0.12	42	42.00	0.00
j3010 10.json	1	0	Optimal	0.11	41	41.00	0.00
j3010 2.json	1	0	Optimal	0.20	56	56.00	0.00
j3010 3.json	1	0	Optimal	0.09	62	62.00	0.00
j3010 4.json	1	0	Optimal	0.10	58	58.00	0.00
j3010 5.json	1	0	Optimal	0.03	41	41.00	0.00
j3010 6.json	1	0	Optimal	0.10	44	44.00	0.00
j3010 7.json	1	0	Optimal	0.02	49	49.00	0.00
j3010 8.json	1	0	Optimal	0.10	54	54.00	0.00
j3010 9.json	1	0	Optimal	0.03	49	49.00	0.00
j3011 1.json	1	0	Optimal	0.02	54	54.00	0.00
j3011 10.json	1	0	Optimal	0.02	38	38.00	0.00
j3011 2.json	1	0	Optimal	0.02	56	56.00	0.00
j3011 3.json	1	0	Optimal	0.02	81	81.00	0.00
j3011 4.json	1	0	Optimal	0.03	63	63.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3011 5.json	1	0	Optimal	0.11	49	49.00	0.00
j3011 6.json	1	0	Optimal	0.02	44	44.00	0.00
j3011 7.json	1	0	Optimal	0.02	36	36.00	0.00
j3011 8.json	1	0	Optimal	0.03	62	62.00	0.00
j3011 9.json	1	0	Optimal	0.02	67	67.00	0.00
j3012 1.json	1	0	Optimal	0.02	47	47.00	0.00
j3012 10.json	1	0	Optimal	0.02	57	57.00	0.00
j3012 2.json	1	0	Optimal	0.02	46	46.00	0.00
j3012 3.json	1	0	Optimal	0.02	37	37.00	0.00
j3012 4.json	1	0	Optimal	0.02	63	63.00	0.00
j3012 5.json	1	0	Optimal	0.02	47	47.00	0.00
j3012 6.json	1	0	Optimal	0.02	53	53.00	0.00
j3012 7.json	1	0	Optimal	0.02	55	55.00	0.00
j3012 8.json	1	0	Optimal	0.02	35	35.00	0.00
j3012 9.json	1	0	Optimal	0.03	52	52.00	0.00
j3013 1.json	1	0	Optimal	7.46	58	58.00	0.00
j3013 10.json	1	0	Optimal	1.82	64	64.00	0.00
j3013 2.json	1	0	Optimal	29.16	62	62.00	0.00
j3013 3.json	1	0	Optimal	5.16	76	76.00	0.00
j3013 4.json	1	0	Optimal	2.17	72	72.00	0.00
j3013 5.json	1	0	Optimal	11.34	67	67.00	0.00
j3013 6.json	1	0	Optimal	17.89	64	64.00	0.00
j3013 7.json	1	0	Optimal	4.13	77	77.00	0.00
j3013 8.json	1	0	Optimal	11.54	106	106.00	0.00
j3013 9.json	1	0	Optimal	1.04	71	69.00	2.82
j3014 1.json	1	0	Optimal	0.18	50	50.00	0.00
j3014 10.json	1	0	Optimal	0.04	61	61.00	0.00
j3014 2.json	1	0	Optimal	0.65	53	53.00	0.00
j3014 3.json	1	0	Optimal	0.08	58	58.00	0.00
j3014 4.json	1	0	Optimal	0.46	50	50.00	0.00
j3014 5.json	1	0	Optimal	0.03	52	52.00	0.00
j3014 6.json	1	0	Optimal	0.02	35	35.00	0.00
j3014 7.json	1	0	Optimal	0.47	50	50.00	0.00
j3014 8.json	1	0	Optimal	0.02	54	54.00	0.00
j3014 9.json	1	0	Optimal	0.27	46	46.00	0.00
j3015 1.json	1	0	Optimal	0.02	46	46.00	0.00
j3015 10.json	1	0	Optimal	0.02	65	65.00	0.00
j3015 2.json	1	0	Optimal	0.02	47	47.00	0.00
j3015 3.json	1	0	Optimal	0.02	48	48.00	0.00
j3015 4.json	1	0	Optimal	0.02	48	48.00	0.00
j3015 5.json	1	0	Optimal	0.32	58	58.00	0.00
j3015 6.json	1	0	Optimal	0.02	67	67.00	0.00
j3015 7.json	1	0	Optimal	0.02	47	47.00	0.00
j3015 8.json	1	0	Optimal	0.02	50	50.00	0.00
j3015 9.json	1	0	Optimal	0.02	54	54.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3016 1.json	1	0	Optimal	0.02	51	51.00	0.00
j3016 10.json	1	0	Optimal	0.02	51	51.00	0.00
j3016 2.json	1	0	Optimal	0.02	48	48.00	0.00
j3016 3.json	1	0	Optimal	0.02	36	36.00	0.00
j3016 4.json	1	0	Optimal	0.02	47	47.00	0.00
j3016 5.json	1	0	Optimal	0.02	51	51.00	0.00
j3016 6.json	1	0	Optimal	0.02	51	51.00	0.00
j3016 7.json	1	0	Optimal	0.02	34	34.00	0.00
j3016 8.json	1	0	Optimal	0.03	44	44.00	0.00
j3016 9.json	1	0	Optimal	0.02	44	44.00	0.00
j3017 1.json	1	0	Optimal	0.08	64	64.00	0.00
j3017 10.json	1	0	Optimal	0.02	66	66.00	0.00
j3017 2.json	1	0	Optimal	0.02	68	68.00	0.00
j3017 3.json	1	0	Optimal	0.02	60	60.00	0.00
j3017 4.json	1	0	Optimal	0.02	49	49.00	0.00
j3017 5.json	1	0	Optimal	0.08	47	47.00	0.00
j3017 6.json	1	0	Optimal	0.02	63	63.00	0.00
j3017 7.json	1	0	Optimal	0.07	57	57.00	0.00
j3017 8.json	1	0	Optimal	0.02	61	61.00	0.00
j3017 9.json	1	0	Optimal	0.02	48	48.00	0.00
j3018 1.json	1	0	Optimal	0.02	53	53.00	0.00
j3018 10.json	1	0	Optimal	0.03	49	49.00	0.00
j3018 2.json	1	0	Optimal	0.02	55	55.00	0.00
j3018 3.json	1	0	Optimal	0.02	56	56.00	0.00
j3018 4.json	1	0	Optimal	0.02	70	70.00	0.00
j3018 5.json	1	0	Optimal	0.02	52	52.00	0.00
j3018 6.json	1	0	Optimal	0.02	62	62.00	0.00
j3018 7.json	1	0	Optimal	0.02	48	48.00	0.00
j3018 8.json	1	0	Optimal	0.02	52	52.00	0.00
j3018 9.json	1	0	Optimal	0.02	47	47.00	0.00
j3019 1.json	1	0	Optimal	0.02	40	40.00	0.00
j3019 10.json	1	0	Optimal	0.02	47	47.00	0.00
j3019 2.json	1	0	Optimal	0.02	58	58.00	0.00
j3019 3.json	1	0	Optimal	0.02	83	83.00	0.00
j3019 4.json	1	0	Optimal	0.02	39	39.00	0.00
j3019 5.json	1	0	Optimal	0.02	48	48.00	0.00
j3019 6.json	1	0	Optimal	0.02	49	49.00	0.00
j3019 7.json	1	0	Optimal	0.02	57	57.00	0.00
j3019 8.json	1	0	Optimal	0.02	55	55.00	0.00
j3019 9.json	1	0	Optimal	0.02	38	38.00	0.00
j301 1.json	1	0	Optimal	0.02	43	43.00	0.00
j301 10.json	1	0	Optimal	0.02	45	45.00	0.00
j301 2.json	1	0	Optimal	0.02	47	47.00	0.00
j301 3.json	1	0	Optimal	0.02	47	47.00	0.00
j301 4.json	1	0	Optimal	0.02	62	62.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j301 5.json	1	0	Optimal	0.09	39	39.00	0.00
j301 6.json	1	0	Optimal	0.07	48	48.00	0.00
j301 7.json	1	0	Optimal	0.02	60	60.00	0.00
j301 8.json	1	0	Optimal	0.02	53	53.00	0.00
j301 9.json	1	0	Optimal	0.03	49	49.00	0.00
j3020 1.json	1	0	Optimal	0.02	57	57.00	0.00
j3020 10.json	1	0	Optimal	0.02	37	37.00	0.00
j3020 2.json	1	0	Optimal	0.02	70	70.00	0.00
j3020 3.json	1	0	Optimal	0.02	49	49.00	0.00
j3020 4.json	1	0	Optimal	0.02	43	43.00	0.00
j3020 5.json	1	0	Optimal	0.02	61	61.00	0.00
j3020 6.json	1	0	Optimal	0.02	51	51.00	0.00
j3020 7.json	1	0	Optimal	0.02	42	42.00	0.00
j3020 8.json	1	0	Optimal	0.02	51	51.00	0.00
j3020 9.json	1	0	Optimal	0.02	41	41.00	0.00
j3021 1.json	1	0	Optimal	0.14	84	84.00	0.00
j3021 10.json	1	0	Optimal	0.08	69	69.00	0.00
j3021 2.json	1	0	Optimal	0.15	59	59.00	0.00
j3021 3.json	1	0	Optimal	0.16	76	76.00	0.00
j3021 4.json	1	0	Optimal	0.14	70	70.00	0.00
j3021 5.json	1	0	Optimal	0.08	55	55.00	0.00
j3021 6.json	1	0	Optimal	0.18	76	76.00	0.00
j3021 7.json	1	0	Optimal	0.15	65	65.00	0.00
j3021 8.json	1	0	Optimal	0.15	62	62.00	0.00
j3021 9.json	1	0	Optimal	0.29	69	69.00	0.00
j3022 1.json	1	0	Optimal	0.03	42	42.00	0.00
j3022 10.json	1	0	Optimal	0.02	55	55.00	0.00
j3022 2.json	1	0	Optimal	0.02	45	45.00	0.00
j3022 3.json	1	0	Optimal	0.02	63	63.00	0.00
j3022 4.json	1	0	Optimal	0.02	42	42.00	0.00
j3022 5.json	1	0	Optimal	0.02	52	52.00	0.00
j3022 6.json	1	0	Optimal	0.04	52	52.00	0.00
j3022 7.json	1	0	Optimal	0.10	60	60.00	0.00
j3022 8.json	1	0	Optimal	0.09	55	55.00	0.00
j3022 9.json	1	0	Optimal	0.02	76	76.00	0.00
j3023 1.json	1	0	Optimal	0.02	63	63.00	0.00
j3023 10.json	1	0	Optimal	0.02	61	61.00	0.00
j3023 2.json	1	0	Optimal	0.02	53	53.00	0.00
j3023 3.json	1	0	Optimal	0.02	46	46.00	0.00
j3023 4.json	1	0	Optimal	0.02	65	65.00	0.00
j3023 5.json	1	0	Optimal	0.02	52	52.00	0.00
j3023 6.json	1	0	Optimal	0.02	48	48.00	0.00
j3023 7.json	1	0	Optimal	0.02	60	60.00	0.00
j3023 8.json	1	0	Optimal	0.02	48	48.00	0.00
j3023 9.json	1	0	Optimal	0.02	63	63.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3024 1.json	1	0	Optimal	0.02	53	53.00	0.00
j3024 10.json	1	0	Optimal	0.02	53	53.00	0.00
j3024 2.json	1	0	Optimal	0.02	58	58.00	0.00
j3024 3.json	1	0	Optimal	0.02	69	69.00	0.00
j3024 4.json	1	0	Optimal	0.02	53	53.00	0.00
j3024 5.json	1	0	Optimal	0.02	51	51.00	0.00
j3024 6.json	1	0	Optimal	0.02	56	56.00	0.00
j3024 7.json	1	0	Optimal	0.02	44	44.00	0.00
j3024 8.json	1	0	Optimal	0.02	38	38.00	0.00
j3024 9.json	1	0	Optimal	0.02	43	43.00	0.00
j3025 1.json	1	0	Optimal	1.03	93	93.00	0.00
j3025 10.json	1	0	Optimal	0.31	58	58.00	0.00
j3025 2.json	1	0	Optimal	0.91	75	75.00	0.00
j3025 3.json	1	0	Optimal	1.49	76	76.00	0.00
j3025 4.json	1	0	Optimal	1.08	81	81.00	0.00
j3025 5.json	1	0	Optimal	1.03	72	72.00	0.00
j3025 6.json	1	0	Optimal	0.75	58	58.00	0.00
j3025 7.json	1	0	Optimal	0.77	95	95.00	0.00
j3025 8.json	1	0	Optimal	0.67	69	69.00	0.00
j3025 9.json	1	0	Optimal	0.68	84	84.00	0.00
j3026 1.json	1	0	Optimal	0.02	59	59.00	0.00
j3026 10.json	1	0	Optimal	0.02	49	49.00	0.00
j3026 2.json	1	0	Optimal	0.02	40	40.00	0.00
j3026 3.json	1	0	Optimal	0.02	58	58.00	0.00
j3026 4.json	1	0	Optimal	0.02	62	62.00	0.00
j3026 5.json	1	0	Optimal	0.03	74	74.00	0.00
j3026 6.json	1	0	Optimal	0.09	53	53.00	0.00
j3026 7.json	1	0	Optimal	0.02	56	56.00	0.00
j3026 8.json	1	0	Optimal	0.02	66	66.00	0.00
j3026 9.json	1	0	Optimal	0.10	43	43.00	0.00
j3027 1.json	1	0	Optimal	0.02	43	43.00	0.00
j3027 10.json	1	0	Optimal	0.02	62	62.00	0.00
j3027 2.json	1	0	Optimal	0.02	58	58.00	0.00
j3027 3.json	1	0	Optimal	0.02	60	60.00	0.00
j3027 4.json	1	0	Optimal	0.02	64	64.00	0.00
j3027 5.json	1	0	Optimal	0.02	49	49.00	0.00
j3027 6.json	1	0	Optimal	0.02	59	59.00	0.00
j3027 7.json	1	0	Optimal	0.02	49	49.00	0.00
j3027 8.json	1	0	Optimal	0.02	66	66.00	0.00
j3027 9.json	1	0	Optimal	0.02	55	55.00	0.00
j3028 1.json	1	0	Optimal	0.02	69	69.00	0.00
j3028 10.json	1	0	Optimal	0.02	59	59.00	0.00
j3028 2.json	1	0	Optimal	0.02	57	57.00	0.00
j3028 3.json	1	0	Optimal	0.02	40	40.00	0.00
j3028 4.json	1	0	Optimal	0.02	49	49.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3028 5.json	1	0	Optimal	0.02	73	73.00	0.00
j3028 6.json	1	0	Optimal	0.02	55	55.00	0.00
j3028 7.json	1	0	Optimal	0.02	48	48.00	0.00
j3028 8.json	1	0	Optimal	0.02	53	53.00	0.00
j3028 9.json	1	0	Optimal	0.02	62	62.00	0.00
j3029 1.json	1	0	Optimal	0.79	85	85.00	0.00
j3029 10.json	1	0	Optimal	0.47	76	76.00	0.00
j3029 2.json	1	0	Optimal	1.36	90	90.00	0.00
j3029 3.json	1	0	Optimal	56.03	78	78.00	0.00
j3029 4.json	1	0	Optimal	7.43	103	103.00	0.00
j3029 5.json	1	0	Optimal	1.36	98	98.00	0.00
j3029 6.json	1	0	Optimal	25.83	92	92.00	0.00
j3029 7.json	1	0	Optimal	1.99	73	73.00	0.00
j3029 8.json	1	0	Optimal	17.32	80	80.00	0.00
j3029 9.json	1	0	Optimal	4.06	97	97.00	0.00
j302 1.json	1	0	Optimal	0.02	38	38.00	0.00
j302 10.json	1	0	Optimal	0.02	43	43.00	0.00
j302 2.json	1	0	Optimal	0.02	51	51.00	0.00
j302 3.json	1	0	Optimal	0.02	43	43.00	0.00
j302 4.json	1	0	Optimal	0.02	43	43.00	0.00
j302 5.json	1	0	Optimal	0.02	51	51.00	0.00
j302 6.json	1	0	Optimal	0.02	47	47.00	0.00
j302 7.json	1	0	Optimal	0.02	47	47.00	0.00
j302 8.json	1	0	Optimal	0.02	54	54.00	0.00
j302 9.json	1	0	Optimal	0.02	54	54.00	0.00
j3030 1.json	1	0	Optimal	0.27	47	47.00	0.00
j3030 10.json	1	0	Optimal	0.45	53	53.00	0.00
j3030 2.json	1	0	Optimal	0.49	68	68.00	0.00
j3030 3.json	1	0	Optimal	0.28	55	55.00	0.00
j3030 4.json	1	0	Optimal	0.09	53	53.00	0.00
j3030 5.json	1	0	Optimal	0.18	54	54.00	0.00
j3030 6.json	1	0	Optimal	0.54	62	62.00	0.00
j3030 7.json	1	0	Optimal	0.09	68	68.00	0.00
j3030 8.json	1	0	Optimal	0.10	46	46.00	0.00
j3030 9.json	1	0	Optimal	0.10	46	46.00	0.00
j3031 1.json	1	0	Optimal	0.02	43	43.00	0.00
j3031 10.json	1	0	Optimal	0.20	55	55.00	0.00
j3031 2.json	1	0	Optimal	0.02	63	63.00	0.00
j3031 3.json	1	0	Optimal	0.02	58	58.00	0.00
j3031 4.json	1	0	Optimal	0.02	50	50.00	0.00
j3031 5.json	1	0	Optimal	0.12	52	52.00	0.00
j3031 6.json	1	0	Optimal	0.02	53	53.00	0.00
j3031 7.json	1	0	Optimal	0.02	61	61.00	0.00
j3031 8.json	1	0	Optimal	0.02	58	58.00	0.00
j3031 9.json	1	0	Optimal	0.10	50	50.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3032 1.json	1	0	Optimal	0.02	61	61.00	0.00
j3032 10.json	1	0	Optimal	0.02	51	51.00	0.00
j3032 2.json	1	0	Optimal	0.02	60	60.00	0.00
j3032 3.json	1	0	Optimal	0.02	57	57.00	0.00
j3032 4.json	1	0	Optimal	0.02	68	68.00	0.00
j3032 5.json	1	0	Optimal	0.02	54	54.00	0.00
j3032 6.json	1	0	Optimal	0.02	44	44.00	0.00
j3032 7.json	1	0	Optimal	0.02	35	35.00	0.00
j3032 8.json	1	0	Optimal	0.02	54	54.00	0.00
j3032 9.json	1	0	Optimal	0.02	65	65.00	0.00
j3033 1.json	1	0	Optimal	0.02	65	65.00	0.00
j3033 10.json	1	0	Optimal	0.02	53	53.00	0.00
j3033 2.json	1	0	Optimal	0.02	60	60.00	0.00
j3033 3.json	1	0	Optimal	0.04	55	55.00	0.00
j3033 4.json	1	0	Optimal	0.02	77	77.00	0.00
j3033 5.json	1	0	Optimal	0.02	53	53.00	0.00
j3033 6.json	1	0	Optimal	0.02	59	59.00	0.00
j3033 7.json	1	0	Optimal	0.02	58	58.00	0.00
j3033 8.json	1	0	Optimal	0.10	61	61.00	0.00
j3033 9.json	1	0	Optimal	0.09	65	65.00	0.00
j3034 1.json	1	0	Optimal	0.02	68	68.00	0.00
j3034 10.json	1	0	Optimal	0.02	47	47.00	0.00
j3034 2.json	1	0	Optimal	0.02	44	44.00	0.00
j3034 3.json	1	0	Optimal	0.02	69	69.00	0.00
j3034 4.json	1	0	Optimal	0.02	67	67.00	0.00
j3034 5.json	1	0	Optimal	0.02	63	63.00	0.00
j3034 6.json	1	0	Optimal	0.02	52	52.00	0.00
j3034 7.json	1	0	Optimal	0.02	58	58.00	0.00
j3034 8.json	1	0	Optimal	0.02	58	58.00	0.00
j3034 9.json	1	0	Optimal	0.02	60	60.00	0.00
j3035 1.json	1	0	Optimal	0.02	57	57.00	0.00
j3035 10.json	1	0	Optimal	0.02	59	59.00	0.00
j3035 2.json	1	0	Optimal	0.02	53	53.00	0.00
j3035 3.json	1	0	Optimal	0.02	60	60.00	0.00
j3035 4.json	1	0	Optimal	0.02	50	50.00	0.00
j3035 5.json	1	0	Optimal	0.02	60	60.00	0.00
j3035 6.json	1	0	Optimal	0.02	58	58.00	0.00
j3035 7.json	1	0	Optimal	0.02	61	61.00	0.00
j3035 8.json	1	0	Optimal	0.02	63	63.00	0.00
j3035 9.json	1	0	Optimal	0.02	59	59.00	0.00
j3036 1.json	1	0	Optimal	0.02	66	66.00	0.00
j3036 10.json	1	0	Optimal	0.02	59	59.00	0.00
j3036 2.json	1	0	Optimal	0.02	44	44.00	0.00
j3036 3.json	1	0	Optimal	0.02	61	61.00	0.00
j3036 4.json	1	0	Optimal	0.02	59	59.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3036 5.json	1	0	Optimal	0.02	64	64.00	0.00
j3036 6.json	1	0	Optimal	0.02	46	46.00	0.00
j3036 7.json	1	0	Optimal	0.02	56	56.00	0.00
j3036 8.json	1	0	Optimal	0.02	63	63.00	0.00
j3036 9.json	1	0	Optimal	0.02	59	59.00	0.00
j3037 1.json	1	0	Optimal	0.23	79	79.00	0.00
j3037 10.json	1	0	Optimal	0.16	81	81.00	0.00
j3037 2.json	1	0	Optimal	0.08	69	69.00	0.00
j3037 3.json	1	0	Optimal	0.22	81	81.00	0.00
j3037 4.json	1	0	Optimal	0.24	83	83.00	0.00
j3037 5.json	1	0	Optimal	0.08	80	80.00	0.00
j3037 6.json	1	0	Optimal	0.08	73	73.00	0.00
j3037 7.json	1	0	Optimal	0.39	92	92.00	0.00
j3037 8.json	1	0	Optimal	0.15	72	72.00	0.00
j3037 9.json	1	0	Optimal	0.15	57	57.00	0.00
j3038 1.json	1	0	Optimal	0.02	48	48.00	0.00
j3038 10.json	1	0	Optimal	0.02	60	60.00	0.00
j3038 2.json	1	0	Optimal	0.02	54	54.00	0.00
j3038 3.json	1	0	Optimal	0.02	59	59.00	0.00
j3038 4.json	1	0	Optimal	0.02	59	59.00	0.00
j3038 5.json	1	0	Optimal	0.10	71	71.00	0.00
j3038 6.json	1	0	Optimal	0.02	63	63.00	0.00
j3038 7.json	1	0	Optimal	0.02	65	65.00	0.00
j3038 8.json	1	0	Optimal	0.03	61	61.00	0.00
j3038 9.json	1	0	Optimal	0.02	63	63.00	0.00
j3039 1.json	1	0	Optimal	0.02	55	55.00	0.00
j3039 10.json	1	0	Optimal	0.02	60	60.00	0.00
j3039 2.json	1	0	Optimal	0.02	54	54.00	0.00
j3039 3.json	1	0	Optimal	0.02	54	54.00	0.00
j3039 4.json	1	0	Optimal	0.02	53	53.00	0.00
j3039 5.json	1	0	Optimal	0.02	55	55.00	0.00
j3039 6.json	1	0	Optimal	0.02	69	69.00	0.00
j3039 7.json	1	0	Optimal	0.02	56	56.00	0.00
j3039 8.json	1	0	Optimal	0.02	67	67.00	0.00
j3039 9.json	1	0	Optimal	0.02	64	64.00	0.00
j303 1.json	1	0	Optimal	0.02	72	72.00	0.00
j303 10.json	1	0	Optimal	0.02	59	59.00	0.00
j303 2.json	1	0	Optimal	0.02	40	40.00	0.00
j303 3.json	1	0	Optimal	0.02	57	57.00	0.00
j303 4.json	1	0	Optimal	0.02	98	98.00	0.00
j303 5.json	1	0	Optimal	0.02	53	53.00	0.00
j303 6.json	1	0	Optimal	0.02	54	54.00	0.00
j303 7.json	1	0	Optimal	0.02	48	48.00	0.00
j303 8.json	1	0	Optimal	0.02	54	54.00	0.00
j303 9.json	1	0	Optimal	0.02	65	65.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3040 1.json	1	0	Optimal	0.02	51	51.00	0.00
j3040 10.json	1	0	Optimal	0.02	51	51.00	0.00
j3040 2.json	1	0	Optimal	0.02	56	56.00	0.00
j3040 3.json	1	0	Optimal	0.02	57	57.00	0.00
j3040 4.json	1	0	Optimal	0.02	57	57.00	0.00
j3040 5.json	1	0	Optimal	0.02	65	65.00	0.00
j3040 6.json	1	0	Optimal	0.02	60	60.00	0.00
j3040 7.json	1	0	Optimal	0.02	46	46.00	0.00
j3040 8.json	1	0	Optimal	0.02	57	57.00	0.00
j3040 9.json	1	0	Optimal	0.02	64	64.00	0.00
j3041 1.json	1	0	Optimal	0.23	86	86.00	0.00
j3041 10.json	1	0	Optimal	2.52	99	99.00	0.00
j3041 2.json	1	0	Optimal	1.14	89	89.00	0.00
j3041 3.json	1	0	Optimal	0.42	85	85.00	0.00
j3041 4.json	1	0	Optimal	0.64	78	78.00	0.00
j3041 5.json	1	0	Optimal	0.40	99	99.00	0.00
j3041 6.json	1	0	Optimal	2.30	103	103.00	0.00
j3041 7.json	1	0	Optimal	0.78	92	92.00	0.00
j3041 8.json	1	0	Optimal	1.22	88	88.00	0.00
j3041 9.json	1	0	Optimal	0.29	92	92.00	0.00
j3042 1.json	1	0	Optimal	0.02	58	58.00	0.00
j3042 10.json	1	0	Optimal	0.02	75	75.00	0.00
j3042 2.json	1	0	Optimal	0.10	50	50.00	0.00
j3042 3.json	1	0	Optimal	0.08	60	60.00	0.00
j3042 4.json	1	0	Optimal	0.15	49	49.00	0.00
j3042 5.json	1	0	Optimal	0.02	52	52.00	0.00
j3042 6.json	1	0	Optimal	0.02	66	66.00	0.00
j3042 7.json	1	0	Optimal	0.02	66	66.00	0.00
j3042 8.json	1	0	Optimal	0.09	82	82.00	0.00
j3042 9.json	1	0	Optimal	0.03	60	60.00	0.00
j3043 1.json	1	0	Optimal	0.09	55	55.00	0.00
j3043 10.json	1	0	Optimal	0.02	60	60.00	0.00
j3043 2.json	1	0	Optimal	0.02	43	43.00	0.00
j3043 3.json	1	0	Optimal	0.07	57	57.00	0.00
j3043 4.json	1	0	Optimal	0.02	67	67.00	0.00
j3043 5.json	1	0	Optimal	0.02	64	64.00	0.00
j3043 6.json	1	0	Optimal	0.03	58	58.00	0.00
j3043 7.json	1	0	Optimal	0.02	52	52.00	0.00
j3043 8.json	1	0	Optimal	0.03	62	62.00	0.00
j3043 9.json	1	0	Optimal	0.12	57	57.00	0.00
j3044 1.json	1	0	Optimal	0.02	50	50.00	0.00
j3044 10.json	1	0	Optimal	0.02	63	63.00	0.00
j3044 2.json	1	0	Optimal	0.02	54	54.00	0.00
j3044 3.json	1	0	Optimal	0.03	51	51.00	0.00
j3044 4.json	1	0	Optimal	0.02	57	57.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3044 5.json	1	0	Optimal	0.02	55	55.00	0.00
j3044 6.json	1	0	Optimal	0.02	56	56.00	0.00
j3044 7.json	1	0	Optimal	0.02	42	42.00	0.00
j3044 8.json	1	0	Optimal	0.02	49	49.00	0.00
j3044 9.json	1	0	Optimal	0.02	64	64.00	0.00
j3045 1.json	1	0	Optimal	1.63	82	82.00	0.00
j3045 10.json	1	0	Optimal	1.73	90	90.00	0.00
j3045 2.json	1	0	Optimal	66.04	125	125.00	0.00
j3045 3.json	1	0	Optimal	0.67	92	92.00	0.00
j3045 4.json	1	0	Optimal	0.75	84	84.00	0.00
j3045 5.json	1	0	Optimal	0.82	86	86.00	0.00
j3045 6.json	1	0	Optimal	44.91	129	129.00	0.00
j3045 7.json	1	0	Optimal	1.12	101	101.00	0.00
j3045 8.json	1	0	Optimal	1.39	94	94.00	0.00
j3045 9.json	1	0	Optimal	0.61	82	82.00	0.00
j3046 1.json	1	0	Optimal	0.10	59	59.00	0.00
j3046 10.json	1	0	Optimal	0.46	55	55.00	0.00
j3046 2.json	1	0	Optimal	0.18	67	67.00	0.00
j3046 3.json	1	0	Optimal	0.18	65	65.00	0.00
j3046 4.json	1	0	Optimal	0.03	64	64.00	0.00
j3046 5.json	1	0	Optimal	0.02	57	57.00	0.00
j3046 6.json	1	0	Optimal	0.40	59	59.00	0.00
j3046 7.json	1	0	Optimal	0.49	59	59.00	0.00
j3046 8.json	1	0	Optimal	0.09	58	58.00	0.00
j3046 9.json	1	0	Optimal	0.02	49	49.00	0.00
j3047 1.json	1	0	Optimal	0.02	58	58.00	0.00
j3047 10.json	1	0	Optimal	0.10	60	60.00	0.00
j3047 2.json	1	0	Optimal	0.02	59	59.00	0.00
j3047 3.json	1	0	Optimal	0.02	55	55.00	0.00
j3047 4.json	1	0	Optimal	0.02	49	49.00	0.00
j3047 5.json	1	0	Optimal	0.02	47	47.00	0.00
j3047 6.json	1	0	Optimal	0.02	53	53.00	0.00
j3047 7.json	1	0	Optimal	0.04	66	66.00	0.00
j3047 8.json	1	0	Optimal	0.02	48	48.00	0.00
j3047 9.json	1	0	Optimal	0.02	65	65.00	0.00
j3048 1.json	1	0	Optimal	0.02	63	63.00	0.00
j3048 10.json	1	0	Optimal	0.02	54	54.00	0.00
j3048 2.json	1	0	Optimal	0.02	54	54.00	0.00
j3048 3.json	1	0	Optimal	0.02	50	50.00	0.00
j3048 4.json	1	0	Optimal	0.02	57	57.00	0.00
j3048 5.json	1	0	Optimal	0.02	58	58.00	0.00
j3048 6.json	1	0	Optimal	0.02	58	58.00	0.00
j3048 7.json	1	0	Optimal	0.02	55	55.00	0.00
j3048 8.json	1	0	Optimal	0.02	44	44.00	0.00
j3048 9.json	1	0	Optimal	0.02	59	59.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j304 1.json	1	0	Optimal	0.02	49	49.00	0.00
j304 10.json	1	0	Optimal	0.02	48	48.00	0.00
j304 2.json	1	0	Optimal	0.02	60	60.00	0.00
j304 3.json	1	0	Optimal	0.02	47	47.00	0.00
j304 4.json	1	0	Optimal	0.02	57	57.00	0.00
j304 5.json	1	0	Optimal	0.02	59	59.00	0.00
j304 6.json	1	0	Optimal	0.02	45	45.00	0.00
j304 7.json	1	0	Optimal	0.02	56	56.00	0.00
j304 8.json	1	0	Optimal	0.02	55	55.00	0.00
j304 9.json	1	0	Optimal	0.02	38	38.00	0.00
j305 1.json	1	0	Optimal	0.10	53	53.00	0.00
j305 10.json	1	0	Optimal	0.18	70	70.00	0.00
j305 2.json	1	0	Optimal	0.23	82	82.00	0.00
j305 3.json	1	0	Optimal	0.22	76	76.00	0.00
j305 4.json	1	0	Optimal	0.25	63	63.00	0.00
j305 5.json	1	0	Optimal	0.22	76	76.00	0.00
j305 6.json	1	0	Optimal	0.14	64	64.00	0.00
j305 7.json	1	0	Optimal	0.23	76	76.00	0.00
j305 8.json	1	0	Optimal	0.23	67	67.00	0.00
j305 9.json	1	0	Optimal	0.08	49	49.00	0.00
j306 1.json	1	0	Optimal	0.09	59	59.00	0.00
j306 10.json	1	0	Optimal	0.09	61	61.00	0.00
j306 2.json	1	0	Optimal	0.03	51	51.00	0.00
j306 3.json	1	0	Optimal	0.02	48	48.00	0.00
j306 4.json	1	0	Optimal	0.11	42	42.00	0.00
j306 5.json	1	0	Optimal	0.09	67	67.00	0.00
j306 6.json	1	0	Optimal	0.02	37	37.00	0.00
j306 7.json	1	0	Optimal	0.02	46	46.00	0.00
j306 8.json	1	0	Optimal	0.02	39	39.00	0.00
j306 9.json	1	0	Optimal	0.02	51	51.00	0.00
j307 1.json	1	0	Optimal	0.02	55	55.00	0.00
j307 10.json	1	0	Optimal	0.03	49	49.00	0.00
j307 2.json	1	0	Optimal	0.02	42	42.00	0.00
j307 3.json	1	0	Optimal	0.02	42	42.00	0.00
j307 4.json	1	0	Optimal	0.02	44	44.00	0.00
j307 5.json	1	0	Optimal	0.02	44	44.00	0.00
j307 6.json	1	0	Optimal	0.02	35	35.00	0.00
j307 7.json	1	0	Optimal	0.02	50	50.00	0.00
j307 8.json	1	0	Optimal	0.02	44	44.00	0.00
j307 9.json	1	0	Optimal	0.02	60	60.00	0.00
j308 1.json	1	0	Optimal	0.02	44	44.00	0.00
j308 10.json	1	0	Optimal	0.02	67	67.00	0.00
j308 2.json	1	0	Optimal	0.02	51	51.00	0.00
j308 3.json	1	0	Optimal	0.02	53	53.00	0.00
j308 4.json	1	0	Optimal	0.02	48	48.00	0.00

Table 9.1: Results for RCPSP J30 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j308 5.json	1	0	Optimal	0.02	58	58.00	0.00
j308 6.json	1	0	Optimal	0.02	47	47.00	0.00
j308 7.json	1	0	Optimal	0.02	41	41.00	0.00
j308 8.json	1	0	Optimal	0.02	51	51.00	0.00
j308 9.json	1	0	Optimal	0.02	39	39.00	0.00
j309 1.json	1	0	Optimal	0.92	83	83.00	0.00
j309 10.json	1	0	Optimal	1.21	88	88.00	0.00
j309 2.json	1	0	Optimal	14.64	92	92.00	0.00
j309 3.json	1	0	Optimal	0.40	68	68.00	0.00
j309 4.json	1	0	Optimal	0.38	71	71.00	0.00
j309 5.json	1	0	Optimal	0.23	70	70.00	0.00
j309 6.json	1	0	Optimal	0.48	59	59.00	0.00
j309 7.json	1	0	Optimal	0.75	63	63.00	0.00
j309 8.json	1	0	Optimal	0.53	91	91.00	0.00
j309 9.json	1	0	Optimal	0.85	63	63.00	0.00

9.1.2 CPSat

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3010 1.json	1	0	Optimal	0.10	42	42.00	0.00
j3010 10.json	1	0	Optimal	0.09	41	41.00	0.00
j3010 2.json	1	0	Optimal	0.06	56	56.00	0.00
j3010 3.json	1	0	Optimal	0.05	62	62.00	0.00
j3010 4.json	1	0	Optimal	0.05	58	58.00	0.00
j3010 5.json	1	0	Optimal	0.08	41	41.00	0.00
j3010 6.json	1	0	Optimal	0.04	44	44.00	0.00
j3010 7.json	1	0	Optimal	0.04	49	49.00	0.00
j3010 8.json	1	0	Optimal	0.05	54	54.00	0.00
j3010 9.json	1	0	Optimal	0.02	49	49.00	0.00
j3011 1.json	1	0	Optimal	0.09	54	54.00	0.00
j3011 10.json	1	0	Optimal	0.02	38	38.00	0.00
j3011 2.json	1	0	Optimal	0.04	56	56.00	0.00
j3011 3.json	1	0	Optimal	0.02	81	81.00	0.00
j3011 4.json	1	0	Optimal	0.04	63	63.00	0.00
j3011 5.json	1	0	Optimal	0.04	49	49.00	0.00
j3011 6.json	1	0	Optimal	0.04	44	44.00	0.00
j3011 7.json	1	0	Optimal	0.03	36	36.00	0.00
j3011 8.json	1	0	Optimal	0.10	62	62.00	0.00
j3011 9.json	1	0	Optimal	0.02	67	67.00	0.00
j3012 1.json	1	0	Optimal	0.02	47	47.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3012 10.json	1	0	Optimal	0.02	57	57.00	0.00
j3012 2.json	1	0	Optimal	0.02	46	46.00	0.00
j3012 3.json	1	0	Optimal	0.02	37	37.00	0.00
j3012 4.json	1	0	Optimal	0.02	63	63.00	0.00
j3012 5.json	1	0	Optimal	0.02	47	47.00	0.00
j3012 6.json	1	0	Optimal	0.03	53	53.00	0.00
j3012 7.json	1	0	Optimal	0.02	55	55.00	0.00
j3012 8.json	1	0	Optimal	0.02	35	35.00	0.00
j3012 9.json	1	0	Optimal	0.02	52	52.00	0.00
j3013 1.json	1	0	Optimal	19.42	58	58.00	0.00
j3013 10.json	1	0	Optimal	0.37	64	64.00	0.00
j3013 2.json	1	0	Optimal	80.41	62	62.00	0.00
j3013 3.json	1	0	Optimal	6.63	76	76.00	0.00
j3013 4.json	1	0	Optimal	0.84	72	72.00	0.00
j3013 5.json	1	0	Optimal	47.35	67	67.00	0.00
j3013 6.json	1	0	Optimal	38.61	64	64.00	0.00
j3013 7.json	1	0	Optimal	6.63	77	77.00	0.00
j3013 8.json	1	0	Optimal	5.03	106	106.00	0.00
j3013 9.json	1	0	Optimal	0.47	71	71.00	0.00
j3014 1.json	1	0	Optimal	0.11	50	50.00	0.00
j3014 10.json	1	0	Optimal	0.06	61	61.00	0.00
j3014 2.json	1	0	Optimal	0.25	53	53.00	0.00
j3014 3.json	1	0	Optimal	0.05	58	58.00	0.00
j3014 4.json	1	0	Optimal	0.10	50	50.00	0.00
j3014 5.json	1	0	Optimal	0.06	52	52.00	0.00
j3014 6.json	1	0	Optimal	0.07	35	35.00	0.00
j3014 7.json	1	0	Optimal	0.15	50	50.00	0.00
j3014 8.json	1	0	Optimal	0.04	54	54.00	0.00
j3014 9.json	1	0	Optimal	0.08	46	46.00	0.00
j3015 1.json	1	0	Optimal	0.05	46	46.00	0.00
j3015 10.json	1	0	Optimal	0.03	65	65.00	0.00
j3015 2.json	1	0	Optimal	0.03	47	47.00	0.00
j3015 3.json	1	0	Optimal	0.03	48	48.00	0.00
j3015 4.json	1	0	Optimal	0.02	48	48.00	0.00
j3015 5.json	1	0	Optimal	0.12	58	58.00	0.00
j3015 6.json	1	0	Optimal	0.04	67	67.00	0.00
j3015 7.json	1	0	Optimal	0.03	47	47.00	0.00
j3015 8.json	1	0	Optimal	0.03	50	50.00	0.00
j3015 9.json	1	0	Optimal	0.03	54	54.00	0.00
j3016 1.json	1	0	Optimal	0.03	51	51.00	0.00
j3016 10.json	1	0	Optimal	0.03	51	51.00	0.00
j3016 2.json	1	0	Optimal	0.02	48	48.00	0.00
j3016 3.json	1	0	Optimal	0.02	36	36.00	0.00
j3016 4.json	1	0	Optimal	0.02	47	47.00	0.00
j3016 5.json	1	0	Optimal	0.03	51	51.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3016 6.json	1	0	Optimal	0.02	51	51.00	0.00
j3016 7.json	1	0	Optimal	0.03	34	34.00	0.00
j3016 8.json	1	0	Optimal	0.03	44	44.00	0.00
j3016 9.json	1	0	Optimal	0.02	44	44.00	0.00
j3017 1.json	1	0	Optimal	0.03	64	64.00	0.00
j3017 10.json	1	0	Optimal	0.02	66	66.00	0.00
j3017 2.json	1	0	Optimal	0.03	68	68.00	0.00
j3017 3.json	1	0	Optimal	0.03	60	60.00	0.00
j3017 4.json	1	0	Optimal	0.03	49	49.00	0.00
j3017 5.json	1	0	Optimal	0.03	47	47.00	0.00
j3017 6.json	1	0	Optimal	0.03	63	63.00	0.00
j3017 7.json	1	0	Optimal	0.02	57	57.00	0.00
j3017 8.json	1	0	Optimal	0.04	61	61.00	0.00
j3017 9.json	1	0	Optimal	0.03	48	48.00	0.00
j3018 1.json	1	0	Optimal	0.03	53	53.00	0.00
j3018 10.json	1	0	Optimal	0.02	49	49.00	0.00
j3018 2.json	1	0	Optimal	0.03	55	55.00	0.00
j3018 3.json	1	0	Optimal	0.03	56	56.00	0.00
j3018 4.json	1	0	Optimal	0.02	70	70.00	0.00
j3018 5.json	1	0	Optimal	0.03	52	52.00	0.00
j3018 6.json	1	0	Optimal	0.03	62	62.00	0.00
j3018 7.json	1	0	Optimal	0.03	48	48.00	0.00
j3018 8.json	1	0	Optimal	0.03	52	52.00	0.00
j3018 9.json	1	0	Optimal	0.03	47	47.00	0.00
j3019 1.json	1	0	Optimal	0.02	40	40.00	0.00
j3019 10.json	1	0	Optimal	0.02	47	47.00	0.00
j3019 2.json	1	0	Optimal	0.03	58	58.00	0.00
j3019 3.json	1	0	Optimal	0.03	83	83.00	0.00
j3019 4.json	1	0	Optimal	0.03	39	39.00	0.00
j3019 5.json	1	0	Optimal	0.02	48	48.00	0.00
j3019 6.json	1	0	Optimal	0.02	49	49.00	0.00
j3019 7.json	1	0	Optimal	0.03	57	57.00	0.00
j3019 8.json	1	0	Optimal	0.03	55	55.00	0.00
j3019 9.json	1	0	Optimal	0.02	38	38.00	0.00
j301 1.json	1	0	Optimal	0.11	43	43.00	0.00
j301 10.json	1	0	Optimal	0.03	45	45.00	0.00
j301 2.json	1	0	Optimal	0.02	47	47.00	0.00
j301 3.json	1	0	Optimal	0.03	47	47.00	0.00
j301 4.json	1	0	Optimal	0.03	62	62.00	0.00
j301 5.json	1	0	Optimal	0.03	39	39.00	0.00
j301 6.json	1	0	Optimal	0.03	48	48.00	0.00
j301 7.json	1	0	Optimal	0.03	60	60.00	0.00
j301 8.json	1	0	Optimal	0.04	53	53.00	0.00
j301 9.json	1	0	Optimal	0.03	49	49.00	0.00
j3020 1.json	1	0	Optimal	0.01	57	57.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3020 10.json	1	0	Optimal	0.01	37	37.00	0.00
j3020 2.json	1	0	Optimal	0.01	70	70.00	0.00
j3020 3.json	1	0	Optimal	0.03	49	49.00	0.00
j3020 4.json	1	0	Optimal	0.01	43	43.00	0.00
j3020 5.json	1	0	Optimal	0.02	61	61.00	0.00
j3020 6.json	1	0	Optimal	0.02	51	51.00	0.00
j3020 7.json	1	0	Optimal	0.01	42	42.00	0.00
j3020 8.json	1	0	Optimal	0.01	51	51.00	0.00
j3020 9.json	1	0	Optimal	0.01	41	41.00	0.00
j3021 1.json	1	0	Optimal	0.06	84	84.00	0.00
j3021 10.json	1	0	Optimal	0.07	69	69.00	0.00
j3021 2.json	1	0	Optimal	0.14	59	59.00	0.00
j3021 3.json	1	0	Optimal	0.04	76	76.00	0.00
j3021 4.json	1	0	Optimal	0.17	70	70.00	0.00
j3021 5.json	1	0	Optimal	0.05	55	55.00	0.00
j3021 6.json	1	0	Optimal	0.07	76	76.00	0.00
j3021 7.json	1	0	Optimal	0.07	65	65.00	0.00
j3021 8.json	1	0	Optimal	0.14	62	62.00	0.00
j3021 9.json	1	0	Optimal	0.17	69	69.00	0.00
j3022 1.json	1	0	Optimal	0.04	42	42.00	0.00
j3022 10.json	1	0	Optimal	0.04	55	55.00	0.00
j3022 2.json	1	0	Optimal	0.03	45	45.00	0.00
j3022 3.json	1	0	Optimal	0.03	63	63.00	0.00
j3022 4.json	1	0	Optimal	0.03	42	42.00	0.00
j3022 5.json	1	0	Optimal	0.04	52	52.00	0.00
j3022 6.json	1	0	Optimal	0.04	52	52.00	0.00
j3022 7.json	1	0	Optimal	0.04	60	60.00	0.00
j3022 8.json	1	0	Optimal	0.04	55	55.00	0.00
j3022 9.json	1	0	Optimal	0.02	76	76.00	0.00
j3023 1.json	1	0	Optimal	0.03	63	63.00	0.00
j3023 10.json	1	0	Optimal	0.03	61	61.00	0.00
j3023 2.json	1	0	Optimal	0.02	53	53.00	0.00
j3023 3.json	1	0	Optimal	0.03	46	46.00	0.00
j3023 4.json	1	0	Optimal	0.03	65	65.00	0.00
j3023 5.json	1	0	Optimal	0.03	52	52.00	0.00
j3023 6.json	1	0	Optimal	0.03	48	48.00	0.00
j3023 7.json	1	0	Optimal	0.03	60	60.00	0.00
j3023 8.json	1	0	Optimal	0.04	48	48.00	0.00
j3023 9.json	1	0	Optimal	0.03	63	63.00	0.00
j3024 1.json	1	0	Optimal	0.02	53	53.00	0.00
j3024 10.json	1	0	Optimal	0.01	53	53.00	0.00
j3024 2.json	1	0	Optimal	0.01	58	58.00	0.00
j3024 3.json	1	0	Optimal	0.01	69	69.00	0.00
j3024 4.json	1	0	Optimal	0.02	53	53.00	0.00
j3024 5.json	1	0	Optimal	0.01	51	51.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3024 6.json	1	0	Optimal	0.01	56	56.00	0.00
j3024 7.json	1	0	Optimal	0.03	44	44.00	0.00
j3024 8.json	1	0	Optimal	0.02	38	38.00	0.00
j3024 9.json	1	0	Optimal	0.03	43	43.00	0.00
j3025 1.json	1	0	Optimal	0.82	93	93.00	0.00
j3025 10.json	1	0	Optimal	0.08	58	58.00	0.00
j3025 2.json	1	0	Optimal	0.37	75	75.00	0.00
j3025 3.json	1	0	Optimal	0.62	76	76.00	0.00
j3025 4.json	1	0	Optimal	1.25	81	81.00	0.00
j3025 5.json	1	0	Optimal	0.76	72	72.00	0.00
j3025 6.json	1	0	Optimal	0.33	58	58.00	0.00
j3025 7.json	1	0	Optimal	0.32	95	95.00	0.00
j3025 8.json	1	0	Optimal	0.40	69	69.00	0.00
j3025 9.json	1	0	Optimal	0.21	84	84.00	0.00
j3026 1.json	1	0	Optimal	0.06	59	59.00	0.00
j3026 10.json	1	0	Optimal	0.04	49	49.00	0.00
j3026 2.json	1	0	Optimal	0.03	40	40.00	0.00
j3026 3.json	1	0	Optimal	0.03	58	58.00	0.00
j3026 4.json	1	0	Optimal	0.03	62	62.00	0.00
j3026 5.json	1	0	Optimal	0.03	74	74.00	0.00
j3026 6.json	1	0	Optimal	0.04	53	53.00	0.00
j3026 7.json	1	0	Optimal	0.06	56	56.00	0.00
j3026 8.json	1	0	Optimal	0.04	66	66.00	0.00
j3026 9.json	1	0	Optimal	0.04	43	43.00	0.00
j3027 1.json	1	0	Optimal	0.03	43	43.00	0.00
j3027 10.json	1	0	Optimal	0.03	62	62.00	0.00
j3027 2.json	1	0	Optimal	0.03	58	58.00	0.00
j3027 3.json	1	0	Optimal	0.03	60	60.00	0.00
j3027 4.json	1	0	Optimal	0.03	64	64.00	0.00
j3027 5.json	1	0	Optimal	0.04	49	49.00	0.00
j3027 6.json	1	0	Optimal	0.05	59	59.00	0.00
j3027 7.json	1	0	Optimal	0.04	49	49.00	0.00
j3027 8.json	1	0	Optimal	0.03	66	66.00	0.00
j3027 9.json	1	0	Optimal	0.03	55	55.00	0.00
j3028 1.json	1	0	Optimal	0.03	69	69.00	0.00
j3028 10.json	1	0	Optimal	0.01	59	59.00	0.00
j3028 2.json	1	0	Optimal	0.02	57	57.00	0.00
j3028 3.json	1	0	Optimal	0.02	40	40.00	0.00
j3028 4.json	1	0	Optimal	0.02	49	49.00	0.00
j3028 5.json	1	0	Optimal	0.02	73	73.00	0.00
j3028 6.json	1	0	Optimal	0.01	55	55.00	0.00
j3028 7.json	1	0	Optimal	0.01	48	48.00	0.00
j3028 8.json	1	0	Optimal	0.01	53	53.00	0.00
j3028 9.json	1	0	Optimal	0.01	62	62.00	0.00
j3029 1.json	1	0	Optimal	0.18	85	85.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3029 10.json	1	0	Optimal	0.12	76	76.00	0.00
j3029 2.json	1	0	Optimal	0.67	90	90.00	0.00
j3029 3.json	1	0	Optimal	13.50	78	78.00	0.00
j3029 4.json	1	0	Optimal	5.92	103	103.00	0.00
j3029 5.json	1	0	Optimal	0.80	98	98.00	0.00
j3029 6.json	1	0	Optimal	18.71	92	92.00	0.00
j3029 7.json	1	0	Optimal	0.78	73	73.00	0.00
j3029 8.json	1	0	Optimal	19.68	80	80.00	0.00
j3029 9.json	1	0	Optimal	4.50	97	97.00	0.00
j302 1.json	1	0	Optimal	0.03	38	38.00	0.00
j302 10.json	1	0	Optimal	0.02	43	43.00	0.00
j302 2.json	1	0	Optimal	0.03	51	51.00	0.00
j302 3.json	1	0	Optimal	0.03	43	43.00	0.00
j302 4.json	1	0	Optimal	0.03	43	43.00	0.00
j302 5.json	1	0	Optimal	0.02	51	51.00	0.00
j302 6.json	1	0	Optimal	0.03	47	47.00	0.00
j302 7.json	1	0	Optimal	0.03	47	47.00	0.00
j302 8.json	1	0	Optimal	0.01	54	54.00	0.00
j302 9.json	1	0	Optimal	0.03	54	54.00	0.00
j3030 1.json	1	0	Optimal	0.07	47	47.00	0.00
j3030 10.json	1	0	Optimal	0.12	53	53.00	0.00
j3030 2.json	1	0	Optimal	0.12	68	68.00	0.00
j3030 3.json	1	0	Optimal	0.05	55	55.00	0.00
j3030 4.json	1	0	Optimal	0.06	53	53.00	0.00
j3030 5.json	1	0	Optimal	0.09	54	54.00	0.00
j3030 6.json	1	0	Optimal	0.11	62	62.00	0.00
j3030 7.json	1	0	Optimal	0.08	68	68.00	0.00
j3030 8.json	1	0	Optimal	0.06	46	46.00	0.00
j3030 9.json	1	0	Optimal	0.04	46	46.00	0.00
j3031 1.json	1	0	Optimal	0.03	43	43.00	0.00
j3031 10.json	1	0	Optimal	0.03	55	55.00	0.00
j3031 2.json	1	0	Optimal	0.03	63	63.00	0.00
j3031 3.json	1	0	Optimal	0.03	58	58.00	0.00
j3031 4.json	1	0	Optimal	0.03	50	50.00	0.00
j3031 5.json	1	0	Optimal	0.04	52	52.00	0.00
j3031 6.json	1	0	Optimal	0.03	53	53.00	0.00
j3031 7.json	1	0	Optimal	0.03	61	61.00	0.00
j3031 8.json	1	0	Optimal	0.03	58	58.00	0.00
j3031 9.json	1	0	Optimal	0.04	50	50.00	0.00
j3032 1.json	1	0	Optimal	0.03	61	61.00	0.00
j3032 10.json	1	0	Optimal	0.01	51	51.00	0.00
j3032 2.json	1	0	Optimal	0.01	60	60.00	0.00
j3032 3.json	1	0	Optimal	0.02	57	57.00	0.00
j3032 4.json	1	0	Optimal	0.03	68	68.00	0.00
j3032 5.json	1	0	Optimal	0.03	54	54.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3032 6.json	1	0	Optimal	0.03	44	44.00	0.00
j3032 7.json	1	0	Optimal	0.03	35	35.00	0.00
j3032 8.json	1	0	Optimal	0.01	54	54.00	0.00
j3032 9.json	1	0	Optimal	0.03	65	65.00	0.00
j3033 1.json	1	0	Optimal	0.03	65	65.00	0.00
j3033 10.json	1	0	Optimal	0.03	53	53.00	0.00
j3033 2.json	1	0	Optimal	0.03	60	60.00	0.00
j3033 3.json	1	0	Optimal	0.03	55	55.00	0.00
j3033 4.json	1	0	Optimal	0.03	77	77.00	0.00
j3033 5.json	1	0	Optimal	0.02	53	53.00	0.00
j3033 6.json	1	0	Optimal	0.03	59	59.00	0.00
j3033 7.json	1	0	Optimal	0.03	58	58.00	0.00
j3033 8.json	1	0	Optimal	0.03	61	61.00	0.00
j3033 9.json	1	0	Optimal	0.03	65	65.00	0.00
j3034 1.json	1	0	Optimal	0.03	68	68.00	0.00
j3034 10.json	1	0	Optimal	0.03	47	47.00	0.00
j3034 2.json	1	0	Optimal	0.01	44	44.00	0.00
j3034 3.json	1	0	Optimal	0.01	69	69.00	0.00
j3034 4.json	1	0	Optimal	0.01	67	67.00	0.00
j3034 5.json	1	0	Optimal	0.03	63	63.00	0.00
j3034 6.json	1	0	Optimal	0.03	52	52.00	0.00
j3034 7.json	1	0	Optimal	0.03	58	58.00	0.00
j3034 8.json	1	0	Optimal	0.03	58	58.00	0.00
j3034 9.json	1	0	Optimal	0.03	60	60.00	0.00
j3035 1.json	1	0	Optimal	0.03	57	57.00	0.00
j3035 10.json	1	0	Optimal	0.01	59	59.00	0.00
j3035 2.json	1	0	Optimal	0.03	53	53.00	0.00
j3035 3.json	1	0	Optimal	0.03	60	60.00	0.00
j3035 4.json	1	0	Optimal	0.03	50	50.00	0.00
j3035 5.json	1	0	Optimal	0.03	60	60.00	0.00
j3035 6.json	1	0	Optimal	0.03	58	58.00	0.00
j3035 7.json	1	0	Optimal	0.02	61	61.00	0.00
j3035 8.json	1	0	Optimal	0.02	63	63.00	0.00
j3035 9.json	1	0	Optimal	0.03	59	59.00	0.00
j3036 1.json	1	0	Optimal	0.02	66	66.00	0.00
j3036 10.json	1	0	Optimal	0.02	59	59.00	0.00
j3036 2.json	1	0	Optimal	0.02	44	44.00	0.00
j3036 3.json	1	0	Optimal	0.01	61	61.00	0.00
j3036 4.json	1	0	Optimal	0.01	59	59.00	0.00
j3036 5.json	1	0	Optimal	0.01	64	64.00	0.00
j3036 6.json	1	0	Optimal	0.01	46	46.00	0.00
j3036 7.json	1	0	Optimal	0.03	56	56.00	0.00
j3036 8.json	1	0	Optimal	0.03	63	63.00	0.00
j3036 9.json	1	0	Optimal	0.01	59	59.00	0.00
j3037 1.json	1	0	Optimal	0.17	79	79.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3037 10.json	1	0	Optimal	0.04	81	81.00	0.00
j3037 2.json	1	0	Optimal	0.12	69	69.00	0.00
j3037 3.json	1	0	Optimal	0.12	81	81.00	0.00
j3037 4.json	1	0	Optimal	0.07	83	83.00	0.00
j3037 5.json	1	0	Optimal	0.06	80	80.00	0.00
j3037 6.json	1	0	Optimal	0.06	73	73.00	0.00
j3037 7.json	1	0	Optimal	0.20	92	92.00	0.00
j3037 8.json	1	0	Optimal	0.06	72	72.00	0.00
j3037 9.json	1	0	Optimal	0.04	57	57.00	0.00
j3038 1.json	1	0	Optimal	0.03	48	48.00	0.00
j3038 10.json	1	0	Optimal	0.03	60	60.00	0.00
j3038 2.json	1	0	Optimal	0.03	54	54.00	0.00
j3038 3.json	1	0	Optimal	0.04	59	59.00	0.00
j3038 4.json	1	0	Optimal	0.03	59	59.00	0.00
j3038 5.json	1	0	Optimal	0.03	71	71.00	0.00
j3038 6.json	1	0	Optimal	0.03	63	63.00	0.00
j3038 7.json	1	0	Optimal	0.03	65	65.00	0.00
j3038 8.json	1	0	Optimal	0.03	61	61.00	0.00
j3038 9.json	1	0	Optimal	0.04	63	63.00	0.00
j3039 1.json	1	0	Optimal	0.03	55	55.00	0.00
j3039 10.json	1	0	Optimal	0.03	60	60.00	0.00
j3039 2.json	1	0	Optimal	0.03	54	54.00	0.00
j3039 3.json	1	0	Optimal	0.03	54	54.00	0.00
j3039 4.json	1	0	Optimal	0.03	53	53.00	0.00
j3039 5.json	1	0	Optimal	0.03	55	55.00	0.00
j3039 6.json	1	0	Optimal	0.03	69	69.00	0.00
j3039 7.json	1	0	Optimal	0.03	56	56.00	0.00
j3039 8.json	1	0	Optimal	0.03	67	67.00	0.00
j3039 9.json	1	0	Optimal	0.03	64	64.00	0.00
j303 1.json	1	0	Optimal	0.03	72	72.00	0.00
j303 10.json	1	0	Optimal	0.03	59	59.00	0.00
j303 2.json	1	0	Optimal	0.03	40	40.00	0.00
j303 3.json	1	0	Optimal	0.01	57	57.00	0.00
j303 4.json	1	0	Optimal	0.01	98	98.00	0.00
j303 5.json	1	0	Optimal	0.01	53	53.00	0.00
j303 6.json	1	0	Optimal	0.01	54	54.00	0.00
j303 7.json	1	0	Optimal	0.01	48	48.00	0.00
j303 8.json	1	0	Optimal	0.01	54	54.00	0.00
j303 9.json	1	0	Optimal	0.01	65	65.00	0.00
j3040 1.json	1	0	Optimal	0.03	51	51.00	0.00
j3040 10.json	1	0	Optimal	0.01	51	51.00	0.00
j3040 2.json	1	0	Optimal	0.01	56	56.00	0.00
j3040 3.json	1	0	Optimal	0.01	57	57.00	0.00
j3040 4.json	1	0	Optimal	0.03	57	57.00	0.00
j3040 5.json	1	0	Optimal	0.03	65	65.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3040 6.json	1	0	Optimal	0.01	60	60.00	0.00
j3040 7.json	1	0	Optimal	0.03	46	46.00	0.00
j3040 8.json	1	0	Optimal	0.03	57	57.00	0.00
j3040 9.json	1	0	Optimal	0.03	64	64.00	0.00
j3041 1.json	1	0	Optimal	0.17	86	86.00	0.00
j3041 10.json	1	0	Optimal	2.73	99	99.00	0.00
j3041 2.json	1	0	Optimal	0.28	89	89.00	0.00
j3041 3.json	1	0	Optimal	0.16	85	85.00	0.00
j3041 4.json	1	0	Optimal	0.12	78	78.00	0.00
j3041 5.json	1	0	Optimal	0.20	99	99.00	0.00
j3041 6.json	1	0	Optimal	0.68	103	103.00	0.00
j3041 7.json	1	0	Optimal	0.26	92	92.00	0.00
j3041 8.json	1	0	Optimal	0.53	88	88.00	0.00
j3041 9.json	1	0	Optimal	0.23	92	92.00	0.00
j3042 1.json	1	0	Optimal	0.04	58	58.00	0.00
j3042 10.json	1	0	Optimal	0.03	75	75.00	0.00
j3042 2.json	1	0	Optimal	0.04	50	50.00	0.00
j3042 3.json	1	0	Optimal	0.03	60	60.00	0.00
j3042 4.json	1	0	Optimal	0.06	49	49.00	0.00
j3042 5.json	1	0	Optimal	0.03	52	52.00	0.00
j3042 6.json	1	0	Optimal	0.04	66	66.00	0.00
j3042 7.json	1	0	Optimal	0.03	66	66.00	0.00
j3042 8.json	1	0	Optimal	0.06	82	82.00	0.00
j3042 9.json	1	0	Optimal	0.06	60	60.00	0.00
j3043 1.json	1	0	Optimal	0.04	55	55.00	0.00
j3043 10.json	1	0	Optimal	0.04	60	60.00	0.00
j3043 2.json	1	0	Optimal	0.03	43	43.00	0.00
j3043 3.json	1	0	Optimal	0.03	57	57.00	0.00
j3043 4.json	1	0	Optimal	0.03	67	67.00	0.00
j3043 5.json	1	0	Optimal	0.04	64	64.00	0.00
j3043 6.json	1	0	Optimal	0.03	58	58.00	0.00
j3043 7.json	1	0	Optimal	0.03	52	52.00	0.00
j3043 8.json	1	0	Optimal	0.03	62	62.00	0.00
j3043 9.json	1	0	Optimal	0.03	57	57.00	0.00
j3044 1.json	1	0	Optimal	0.03	50	50.00	0.00
j3044 10.json	1	0	Optimal	0.01	63	63.00	0.00
j3044 2.json	1	0	Optimal	0.01	54	54.00	0.00
j3044 3.json	1	0	Optimal	0.01	51	51.00	0.00
j3044 4.json	1	0	Optimal	0.03	57	57.00	0.00
j3044 5.json	1	0	Optimal	0.03	55	55.00	0.00
j3044 6.json	1	0	Optimal	0.03	56	56.00	0.00
j3044 7.json	1	0	Optimal	0.03	42	42.00	0.00
j3044 8.json	1	0	Optimal	0.03	49	49.00	0.00
j3044 9.json	1	0	Optimal	0.01	64	64.00	0.00
j3045 1.json	1	0	Optimal	0.91	82	82.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j3045 10.json	1	0	Optimal	0.76	90	90.00	0.00
j3045 2.json	1	0	Optimal	7.18	125	125.00	0.00
j3045 3.json	1	0	Optimal	0.14	92	92.00	0.00
j3045 4.json	1	0	Optimal	0.24	84	84.00	0.00
j3045 5.json	1	0	Optimal	0.26	86	86.00	0.00
j3045 6.json	1	0	Optimal	7.20	129	129.00	0.00
j3045 7.json	1	0	Optimal	0.19	101	101.00	0.00
j3045 8.json	1	0	Optimal	0.37	94	94.00	0.00
j3045 9.json	1	0	Optimal	0.20	82	82.00	0.00
j3046 1.json	1	0	Optimal	0.05	59	59.00	0.00
j3046 10.json	1	0	Optimal	0.11	55	55.00	0.00
j3046 2.json	1	0	Optimal	0.07	67	67.00	0.00
j3046 3.json	1	0	Optimal	0.06	65	65.00	0.00
j3046 4.json	1	0	Optimal	0.04	64	64.00	0.00
j3046 5.json	1	0	Optimal	0.04	57	57.00	0.00
j3046 6.json	1	0	Optimal	0.06	59	59.00	0.00
j3046 7.json	1	0	Optimal	0.15	59	59.00	0.00
j3046 8.json	1	0	Optimal	0.04	58	58.00	0.00
j3046 9.json	1	0	Optimal	0.06	49	49.00	0.00
j3047 1.json	1	0	Optimal	0.03	58	58.00	0.00
j3047 10.json	1	0	Optimal	0.03	60	60.00	0.00
j3047 2.json	1	0	Optimal	0.03	59	59.00	0.00
j3047 3.json	1	0	Optimal	0.03	55	55.00	0.00
j3047 4.json	1	0	Optimal	0.03	49	49.00	0.00
j3047 5.json	1	0	Optimal	0.03	47	47.00	0.00
j3047 6.json	1	0	Optimal	0.03	53	53.00	0.00
j3047 7.json	1	0	Optimal	0.03	66	66.00	0.00
j3047 8.json	1	0	Optimal	0.03	48	48.00	0.00
j3047 9.json	1	0	Optimal	0.03	65	65.00	0.00
j3048 1.json	1	0	Optimal	0.03	63	63.00	0.00
j3048 10.json	1	0	Optimal	0.03	54	54.00	0.00
j3048 2.json	1	0	Optimal	0.01	54	54.00	0.00
j3048 3.json	1	0	Optimal	0.02	50	50.00	0.00
j3048 4.json	1	0	Optimal	0.01	57	57.00	0.00
j3048 5.json	1	0	Optimal	0.03	58	58.00	0.00
j3048 6.json	1	0	Optimal	0.02	58	58.00	0.00
j3048 7.json	1	0	Optimal	0.02	55	55.00	0.00
j3048 8.json	1	0	Optimal	0.03	44	44.00	0.00
j3048 9.json	1	0	Optimal	0.03	59	59.00	0.00
j304 1.json	1	0	Optimal	0.01	49	49.00	0.00
j304 10.json	1	0	Optimal	0.01	48	48.00	0.00
j304 2.json	1	0	Optimal	0.01	60	60.00	0.00
j304 3.json	1	0	Optimal	0.01	47	47.00	0.00
j304 4.json	1	0	Optimal	0.01	57	57.00	0.00
j304 5.json	1	0	Optimal	0.01	59	59.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j304 6.json	1	0	Optimal	0.01	45	45.00	0.00
j304 7.json	1	0	Optimal	0.01	56	56.00	0.00
j304 8.json	1	0	Optimal	0.01	55	55.00	0.00
j304 9.json	1	0	Optimal	0.01	38	38.00	0.00
j305 1.json	1	0	Optimal	0.04	53	53.00	0.00
j305 10.json	1	0	Optimal	0.06	70	70.00	0.00
j305 2.json	1	0	Optimal	0.13	82	82.00	0.00
j305 3.json	1	0	Optimal	0.31	76	76.00	0.00
j305 4.json	1	0	Optimal	0.08	63	63.00	0.00
j305 5.json	1	0	Optimal	0.12	76	76.00	0.00
j305 6.json	1	0	Optimal	0.04	64	64.00	0.00
j305 7.json	1	0	Optimal	0.16	76	76.00	0.00
j305 8.json	1	0	Optimal	0.12	67	67.00	0.00
j305 9.json	1	0	Optimal	0.06	49	49.00	0.00
j306 1.json	1	0	Optimal	0.04	59	59.00	0.00
j306 10.json	1	0	Optimal	0.05	61	61.00	0.00
j306 2.json	1	0	Optimal	0.04	51	51.00	0.00
j306 3.json	1	0	Optimal	0.04	48	48.00	0.00
j306 4.json	1	0	Optimal	0.04	42	42.00	0.00
j306 5.json	1	0	Optimal	0.03	67	67.00	0.00
j306 6.json	1	0	Optimal	0.03	37	37.00	0.00
j306 7.json	1	0	Optimal	0.04	46	46.00	0.00
j306 8.json	1	0	Optimal	0.04	39	39.00	0.00
j306 9.json	1	0	Optimal	0.03	51	51.00	0.00
j307 1.json	1	0	Optimal	0.03	55	55.00	0.00
j307 10.json	1	0	Optimal	0.03	49	49.00	0.00
j307 2.json	1	0	Optimal	0.03	42	42.00	0.00
j307 3.json	1	0	Optimal	0.03	42	42.00	0.00
j307 4.json	1	0	Optimal	0.03	44	44.00	0.00
j307 5.json	1	0	Optimal	0.03	44	44.00	0.00
j307 6.json	1	0	Optimal	0.03	35	35.00	0.00
j307 7.json	1	0	Optimal	0.03	50	50.00	0.00
j307 8.json	1	0	Optimal	0.03	44	44.00	0.00
j307 9.json	1	0	Optimal	0.03	60	60.00	0.00
j308 1.json	1	0	Optimal	0.01	44	44.00	0.00
j308 10.json	1	0	Optimal	0.01	67	67.00	0.00
j308 2.json	1	0	Optimal	0.01	51	51.00	0.00
j308 3.json	1	0	Optimal	0.01	53	53.00	0.00
j308 4.json	1	0	Optimal	0.01	48	48.00	0.00
j308 5.json	1	0	Optimal	0.01	58	58.00	0.00
j308 6.json	1	0	Optimal	0.01	47	47.00	0.00
j308 7.json	1	0	Optimal	0.01	41	41.00	0.00
j308 8.json	1	0	Optimal	0.01	51	51.00	0.00
j308 9.json	1	0	Optimal	0.01	39	39.00	0.00
j309 1.json	1	0	Optimal	0.61	83	83.00	0.00

Table 9.2: Results for RCPSP J30 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j309 10.json	1	0	Optimal	0.64	88	88.00	0.00
j309 2.json	1	0	Optimal	7.05	92	92.00	0.00
j309 3.json	1	0	Optimal	0.15	68	68.00	0.00
j309 4.json	1	0	Optimal	0.30	71	71.00	0.00
j309 5.json	1	0	Optimal	0.09	70	70.00	0.00
j309 6.json	1	0	Optimal	0.17	59	59.00	0.00
j309 7.json	1	0	Optimal	0.31	63	63.00	0.00
j309 8.json	1	0	Optimal	0.34	91	91.00	0.00
j309 9.json	1	0	Optimal	0.72	63	63.00	0.00

9.2 Size J60

9.2.1 CPO

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6010 1.json	1	0	Optimal	0.12	85	85.00	0.00
j6010 10.json	1	0	Optimal	0.03	73	73.00	0.00
j6010 2.json	1	0	Optimal	0.02	62	62.00	0.00
j6010 3.json	1	0	Optimal	0.03	72	72.00	0.00
j6010 4.json	1	0	Optimal	0.02	80	80.00	0.00
j6010 5.json	1	0	Optimal	0.02	79	79.00	0.00
j6010 6.json	1	0	Optimal	0.02	67	67.00	0.00
j6010 7.json	1	0	Optimal	0.04	69	69.00	0.00
j6010 8.json	1	0	Optimal	0.03	65	65.00	0.00
j6010 9.json	1	0	Optimal	0.05	73	73.00	0.00
j6011 1.json	1	0	Optimal	0.02	71	71.00	0.00
j6011 10.json	1	0	Optimal	0.03	58	58.00	0.00
j6011 2.json	1	0	Optimal	0.02	61	61.00	0.00
j6011 3.json	1	0	Optimal	0.02	76	76.00	0.00
j6011 4.json	1	0	Optimal	0.02	69	69.00	0.00
j6011 5.json	1	0	Optimal	0.02	65	65.00	0.00
j6011 6.json	1	0	Optimal	0.02	70	70.00	0.00
j6011 7.json	1	0	Optimal	0.02	70	70.00	0.00
j6011 8.json	1	0	Optimal	0.02	69	69.00	0.00
j6011 9.json	1	0	Optimal	0.02	62	62.00	0.00
j6012 1.json	1	0	Optimal	0.02	59	59.00	0.00
j6012 10.json	1	0	Optimal	0.02	79	79.00	0.00
j6012 2.json	1	0	Optimal	0.02	58	58.00	0.00
j6012 3.json	1	0	Optimal	0.02	75	75.00	0.00
j6012 4.json	1	0	Optimal	0.02	69	69.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6012 5.json	1	0	Optimal	0.02	63	63.00	0.00
j6012 6.json	1	0	Optimal	0.02	54	54.00	0.00
j6012 7.json	1	0	Optimal	0.02	71	71.00	0.00
j6012 8.json	1	0	Optimal	0.02	60	60.00	0.00
j6012 9.json	1	0	Optimal	0.03	59	59.00	0.00
j6013 1.json	1	0	Solution	600.01	114	105.00	7.89
j6013 10.json	1	0	Solution	600.01	117	114.00	2.56
j6013 2.json	1	0	Solution	600.01	108	103.00	4.63
j6013 3.json	1	0	Solution	600.01	88	84.00	4.55
j6013 4.json	1	0	Solution	600.01	105	98.00	6.67
j6013 5.json	1	0	Solution	600.01	98	93.00	5.10
j6013 6.json	1	0	Solution	600.01	95	91.00	4.21
j6013 7.json	1	0	Solution	600.01	89	83.00	6.74
j6013 8.json	1	0	Solution	600.01	123	112.00	8.94
j6013 9.json	1	0	Solution	600.01	103	97.00	5.83
j6014 1.json	1	0	Optimal	33.24	61	61.00	0.00
j6014 10.json	1	0	Optimal	56.92	72	72.00	0.00
j6014 2.json	1	0	Optimal	0.03	65	65.00	0.00
j6014 3.json	1	0	Optimal	351.54	61	61.00	0.00
j6014 4.json	1	0	Optimal	0.18	65	65.00	0.00
j6014 5.json	1	0	Optimal	0.03	59	59.00	0.00
j6014 6.json	1	0	Optimal	0.03	65	65.00	0.00
j6014 7.json	1	0	Optimal	0.02	69	69.00	0.00
j6014 8.json	1	0	Optimal	0.03	88	88.00	0.00
j6014 9.json	1	0	Optimal	0.02	61	61.00	0.00
j6015 1.json	1	0	Optimal	0.03	84	84.00	0.00
j6015 10.json	1	0	Optimal	0.02	61	61.00	0.00
j6015 2.json	1	0	Optimal	0.03	89	89.00	0.00
j6015 3.json	1	0	Optimal	0.03	72	72.00	0.00
j6015 4.json	1	0	Optimal	0.03	75	75.00	0.00
j6015 5.json	1	0	Optimal	0.03	70	70.00	0.00
j6015 6.json	1	0	Optimal	0.02	76	76.00	0.00
j6015 7.json	1	0	Optimal	0.02	64	64.00	0.00
j6015 8.json	1	0	Optimal	0.02	79	79.00	0.00
j6015 9.json	1	0	Optimal	0.03	72	72.00	0.00
j6016 1.json	1	0	Optimal	0.03	64	64.00	0.00
j6016 10.json	1	0	Optimal	0.02	68	68.00	0.00
j6016 2.json	1	0	Optimal	0.02	64	64.00	0.00
j6016 3.json	1	0	Optimal	0.02	53	53.00	0.00
j6016 4.json	1	0	Optimal	0.02	60	60.00	0.00
j6016 5.json	1	0	Optimal	0.02	66	66.00	0.00
j6016 6.json	1	0	Optimal	0.03	66	66.00	0.00
j6016 7.json	1	0	Optimal	0.02	82	82.00	0.00
j6016 8.json	1	0	Optimal	0.03	68	68.00	0.00
j6016 9.json	1	0	Optimal	0.02	54	54.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6017 1.json	1	0	Optimal	0.07	86	86.00	0.00
j6017 10.json	1	0	Optimal	0.02	72	72.00	0.00
j6017 2.json	1	0	Optimal	0.07	69	69.00	0.00
j6017 3.json	1	0	Optimal	0.02	89	89.00	0.00
j6017 4.json	1	0	Optimal	0.02	71	71.00	0.00
j6017 5.json	1	0	Optimal	0.06	59	59.00	0.00
j6017 6.json	1	0	Optimal	0.06	69	69.00	0.00
j6017 7.json	1	0	Optimal	0.02	83	83.00	0.00
j6017 8.json	1	0	Optimal	0.19	85	85.00	0.00
j6017 9.json	1	0	Optimal	0.02	76	76.00	0.00
j6018 1.json	1	0	Optimal	0.02	81	81.00	0.00
j6018 10.json	1	0	Optimal	0.02	97	97.00	0.00
j6018 2.json	1	0	Optimal	0.02	69	69.00	0.00
j6018 3.json	1	0	Optimal	0.02	77	77.00	0.00
j6018 4.json	1	0	Optimal	0.02	71	71.00	0.00
j6018 5.json	1	0	Optimal	0.02	80	80.00	0.00
j6018 6.json	1	0	Optimal	0.02	61	61.00	0.00
j6018 7.json	1	0	Optimal	0.03	93	93.00	0.00
j6018 8.json	1	0	Optimal	0.02	78	78.00	0.00
j6018 9.json	1	0	Optimal	0.02	69	69.00	0.00
j6019 1.json	1	0	Optimal	0.02	62	62.00	0.00
j6019 10.json	1	0	Optimal	0.02	78	78.00	0.00
j6019 2.json	1	0	Optimal	0.02	83	83.00	0.00
j6019 3.json	1	0	Optimal	0.02	83	83.00	0.00
j6019 4.json	1	0	Optimal	0.02	67	67.00	0.00
j6019 5.json	1	0	Optimal	0.02	73	73.00	0.00
j6019 6.json	1	0	Optimal	0.02	69	69.00	0.00
j6019 7.json	1	0	Optimal	0.02	60	60.00	0.00
j6019 8.json	1	0	Optimal	0.02	87	87.00	0.00
j6019 9.json	1	0	Optimal	0.02	69	69.00	0.00
j601 1.json	1	0	Optimal	0.02	77	77.00	0.00
j601 10.json	1	0	Optimal	0.02	80	80.00	0.00
j601 2.json	1	0	Optimal	0.02	68	68.00	0.00
j601 3.json	1	0	Optimal	0.02	68	68.00	0.00
j601 4.json	1	0	Optimal	0.08	91	91.00	0.00
j601 5.json	1	0	Optimal	0.04	73	73.00	0.00
j601 6.json	1	0	Optimal	0.36	66	66.00	0.00
j601 7.json	1	0	Optimal	0.21	72	72.00	0.00
j601 8.json	1	0	Optimal	0.02	75	75.00	0.00
j601 9.json	1	0	Optimal	0.03	85	85.00	0.00
j6020 1.json	1	0	Optimal	0.02	60	60.00	0.00
j6020 10.json	1	0	Optimal	0.02	70	70.00	0.00
j6020 2.json	1	0	Optimal	0.02	78	78.00	0.00
j6020 3.json	1	0	Optimal	0.02	69	69.00	0.00
j6020 4.json	1	0	Optimal	0.02	86	86.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6020 5.json	1	0	Optimal	0.02	71	71.00	0.00
j6020 6.json	1	0	Optimal	0.02	97	97.00	0.00
j6020 7.json	1	0	Optimal	0.02	74	74.00	0.00
j6020 8.json	1	0	Optimal	0.02	65	65.00	0.00
j6020 9.json	1	0	Optimal	0.02	74	74.00	0.00
j6021 1.json	1	0	Optimal	1.13	103	103.00	0.00
j6021 10.json	1	0	Optimal	0.85	80	80.00	0.00
j6021 2.json	1	0	Optimal	0.60	108	108.00	0.00
j6021 3.json	1	0	Optimal	0.51	87	87.00	0.00
j6021 4.json	1	0	Optimal	2.82	95	95.00	0.00
j6021 5.json	1	0	Optimal	3.61	89	89.00	0.00
j6021 6.json	1	0	Optimal	1.18	84	84.00	0.00
j6021 7.json	1	0	Optimal	1.55	103	103.00	0.00
j6021 8.json	1	0	Optimal	1.57	110	110.00	0.00
j6021 9.json	1	0	Optimal	9.88	89	89.00	0.00
j6022 1.json	1	0	Optimal	0.02	64	64.00	0.00
j6022 10.json	1	0	Optimal	0.03	70	70.00	0.00
j6022 2.json	1	0	Optimal	0.02	83	83.00	0.00
j6022 3.json	1	0	Optimal	0.03	70	70.00	0.00
j6022 4.json	1	0	Optimal	0.43	73	73.00	0.00
j6022 5.json	1	0	Optimal	0.02	76	76.00	0.00
j6022 6.json	1	0	Optimal	0.07	79	79.00	0.00
j6022 7.json	1	0	Optimal	0.03	69	69.00	0.00
j6022 8.json	1	0	Optimal	0.02	59	59.00	0.00
j6022 9.json	1	0	Optimal	0.02	65	65.00	0.00
j6023 1.json	1	0	Optimal	0.02	75	75.00	0.00
j6023 10.json	1	0	Optimal	0.02	68	68.00	0.00
j6023 2.json	1	0	Optimal	0.02	69	69.00	0.00
j6023 3.json	1	0	Optimal	0.02	78	78.00	0.00
j6023 4.json	1	0	Optimal	0.02	83	83.00	0.00
j6023 5.json	1	0	Optimal	0.02	72	72.00	0.00
j6023 6.json	1	0	Optimal	0.02	81	81.00	0.00
j6023 7.json	1	0	Optimal	0.02	60	60.00	0.00
j6023 8.json	1	0	Optimal	0.02	72	72.00	0.00
j6023 9.json	1	0	Optimal	0.02	64	64.00	0.00
j6024 1.json	1	0	Optimal	0.02	65	65.00	0.00
j6024 10.json	1	0	Optimal	0.02	66	66.00	0.00
j6024 2.json	1	0	Optimal	0.02	55	55.00	0.00
j6024 3.json	1	0	Optimal	0.02	67	67.00	0.00
j6024 4.json	1	0	Optimal	0.02	78	78.00	0.00
j6024 5.json	1	0	Optimal	0.02	76	76.00	0.00
j6024 6.json	1	0	Optimal	0.02	75	75.00	0.00
j6024 7.json	1	0	Optimal	0.02	68	68.00	0.00
j6024 8.json	1	0	Optimal	0.03	81	81.00	0.00
j6024 9.json	1	0	Optimal	0.02	80	80.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6025 1.json	1	0	Solution	600.01	114	102.00	10.53
j6025 10.json	1	0	Solution	600.01	108	102.00	5.56
j6025 2.json	1	0	Solution	600.01	99	91.00	8.08
j6025 3.json	1	0	Optimal	105.03	113	113.00	0.00
j6025 4.json	1	0	Solution	600.01	108	103.00	4.63
j6025 5.json	1	0	Solution	600.01	98	86.00	12.24
j6025 6.json	1	0	Solution	600.01	112	99.00	11.61
j6025 7.json	1	0	Solution	600.01	91	86.00	5.49
j6025 8.json	1	0	Solution	600.01	99	92.00	7.07
j6025 9.json	1	0	Optimal	103.66	99	99.00	0.00
j6026 1.json	1	0	Optimal	0.03	80	80.00	0.00
j6026 10.json	1	0	Optimal	0.02	85	85.00	0.00
j6026 2.json	1	0	Optimal	0.19	66	66.00	0.00
j6026 3.json	1	0	Optimal	2.41	76	76.00	0.00
j6026 4.json	1	0	Optimal	0.95	67	67.00	0.00
j6026 5.json	1	0	Optimal	0.02	61	61.00	0.00
j6026 6.json	1	0	Optimal	0.52	74	74.00	0.00
j6026 7.json	1	0	Optimal	0.03	72	72.00	0.00
j6026 8.json	1	0	Optimal	0.02	89	89.00	0.00
j6026 9.json	1	0	Optimal	1.30	65	65.00	0.00
j6027 1.json	1	0	Optimal	0.03	96	96.00	0.00
j6027 10.json	1	0	Optimal	0.02	57	57.00	0.00
j6027 2.json	1	0	Optimal	0.02	74	74.00	0.00
j6027 3.json	1	0	Optimal	0.03	76	76.00	0.00
j6027 4.json	1	0	Optimal	0.02	60	60.00	0.00
j6027 5.json	1	0	Optimal	0.02	78	78.00	0.00
j6027 6.json	1	0	Optimal	0.02	64	64.00	0.00
j6027 7.json	1	0	Optimal	0.02	83	83.00	0.00
j6027 8.json	1	0	Optimal	0.03	88	88.00	0.00
j6027 9.json	1	0	Optimal	0.02	76	76.00	0.00
j6028 1.json	1	0	Optimal	0.02	92	92.00	0.00
j6028 10.json	1	0	Optimal	0.03	74	74.00	0.00
j6028 2.json	1	0	Optimal	0.02	64	64.00	0.00
j6028 3.json	1	0	Optimal	0.02	72	72.00	0.00
j6028 4.json	1	0	Optimal	0.02	84	84.00	0.00
j6028 5.json	1	0	Optimal	0.02	71	71.00	0.00
j6028 6.json	1	0	Optimal	0.02	89	89.00	0.00
j6028 7.json	1	0	Optimal	0.02	75	75.00	0.00
j6028 8.json	1	0	Optimal	0.02	62	62.00	0.00
j6028 9.json	1	0	Optimal	0.02	74	74.00	0.00
j6029 1.json	1	0	Solution	600.01	104	95.00	8.65
j6029 10.json	1	0	Solution	600.01	120	112.00	6.67
j6029 2.json	1	0	Solution	600.01	133	116.00	12.78
j6029 3.json	1	0	Solution	600.01	122	114.00	6.56
j6029 4.json	1	0	Solution	600.01	137	124.00	9.49

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6029 5.json	1	0	Solution	600.02	110	101.00	8.18
j6029 6.json	1	0	Solution	600.01	156	145.00	7.05
j6029 7.json	1	0	Solution	600.01	125	115.00	8.00
j6029 8.json	1	0	Solution	600.01	103	97.00	5.83
j6029 9.json	1	0	Solution	600.01	113	97.00	14.16
j602 1.json	1	0	Optimal	0.02	65	65.00	0.00
j602 10.json	1	0	Optimal	0.02	69	69.00	0.00
j602 2.json	1	0	Optimal	0.02	82	82.00	0.00
j602 3.json	1	0	Optimal	0.02	78	78.00	0.00
j602 4.json	1	0	Optimal	0.02	78	78.00	0.00
j602 5.json	1	0	Optimal	0.02	54	54.00	0.00
j602 6.json	1	0	Optimal	0.02	64	64.00	0.00
j602 7.json	1	0	Optimal	0.02	53	53.00	0.00
j602 8.json	1	0	Optimal	0.03	66	66.00	0.00
j602 9.json	1	0	Optimal	0.02	65	65.00	0.00
j6030 1.json	1	0	Optimal	0.04	70	70.00	0.00
j6030 10.json	1	0	Optimal	67.18	86	86.00	0.00
j6030 2.json	1	0	Solution	600.01	70	69.00	1.43
j6030 3.json	1	0	Optimal	0.31	82	82.00	0.00
j6030 4.json	1	0	Optimal	0.02	76	76.00	0.00
j6030 5.json	1	0	Optimal	103.34	76	76.00	0.00
j6030 6.json	1	0	Optimal	0.02	68	68.00	0.00
j6030 7.json	1	0	Optimal	46.96	86	86.00	0.00
j6030 8.json	1	0	Optimal	0.03	63	63.00	0.00
j6030 9.json	1	0	Optimal	0.02	98	98.00	0.00
j6031 1.json	1	0	Optimal	0.02	65	65.00	0.00
j6031 10.json	1	0	Optimal	0.02	56	56.00	0.00
j6031 2.json	1	0	Optimal	0.02	74	74.00	0.00
j6031 3.json	1	0	Optimal	0.03	66	66.00	0.00
j6031 4.json	1	0	Optimal	0.03	68	68.00	0.00
j6031 5.json	1	0	Optimal	0.03	72	72.00	0.00
j6031 6.json	1	0	Optimal	0.02	72	72.00	0.00
j6031 7.json	1	0	Optimal	0.02	76	76.00	0.00
j6031 8.json	1	0	Optimal	0.02	75	75.00	0.00
j6031 9.json	1	0	Optimal	0.02	86	86.00	0.00
j6032 1.json	1	0	Optimal	0.02	69	69.00	0.00
j6032 10.json	1	0	Optimal	0.03	77	77.00	0.00
j6032 2.json	1	0	Optimal	0.03	114	114.00	0.00
j6032 3.json	1	0	Optimal	0.03	85	85.00	0.00
j6032 4.json	1	0	Optimal	0.02	56	56.00	0.00
j6032 5.json	1	0	Optimal	0.02	77	77.00	0.00
j6032 6.json	1	0	Optimal	0.02	93	93.00	0.00
j6032 7.json	1	0	Optimal	0.02	76	76.00	0.00
j6032 8.json	1	0	Optimal	0.02	76	76.00	0.00
j6032 9.json	1	0	Optimal	0.02	74	74.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6033 1.json	1	0	Optimal	0.07	105	105.00	0.00
j6033 10.json	1	0	Optimal	0.05	84	84.00	0.00
j6033 2.json	1	0	Optimal	0.02	100	100.00	0.00
j6033 3.json	1	0	Optimal	0.02	79	79.00	0.00
j6033 4.json	1	0	Optimal	0.02	81	81.00	0.00
j6033 5.json	1	0	Optimal	0.08	108	108.00	0.00
j6033 6.json	1	0	Optimal	0.22	75	75.00	0.00
j6033 7.json	1	0	Optimal	0.14	78	78.00	0.00
j6033 8.json	1	0	Optimal	0.03	79	79.00	0.00
j6033 9.json	1	0	Optimal	0.04	108	108.00	0.00
j6034 1.json	1	0	Optimal	0.04	72	72.00	0.00
j6034 10.json	1	0	Optimal	0.02	92	92.00	0.00
j6034 2.json	1	0	Optimal	0.02	68	68.00	0.00
j6034 3.json	1	0	Optimal	0.03	61	61.00	0.00
j6034 4.json	1	0	Optimal	0.02	83	83.00	0.00
j6034 5.json	1	0	Optimal	0.02	80	80.00	0.00
j6034 6.json	1	0	Optimal	0.03	81	81.00	0.00
j6034 7.json	1	0	Optimal	0.02	85	85.00	0.00
j6034 8.json	1	0	Optimal	0.02	63	63.00	0.00
j6034 9.json	1	0	Optimal	0.02	77	77.00	0.00
j6035 1.json	1	0	Optimal	0.03	78	78.00	0.00
j6035 10.json	1	0	Optimal	0.02	71	71.00	0.00
j6035 2.json	1	0	Optimal	0.02	77	77.00	0.00
j6035 3.json	1	0	Optimal	0.02	89	89.00	0.00
j6035 4.json	1	0	Optimal	0.02	72	72.00	0.00
j6035 5.json	1	0	Optimal	0.02	76	76.00	0.00
j6035 6.json	1	0	Optimal	0.02	79	79.00	0.00
j6035 7.json	1	0	Optimal	0.02	73	73.00	0.00
j6035 8.json	1	0	Optimal	0.02	78	78.00	0.00
j6035 9.json	1	0	Optimal	0.02	76	76.00	0.00
j6036 1.json	1	0	Optimal	0.02	61	61.00	0.00
j6036 10.json	1	0	Optimal	0.02	77	77.00	0.00
j6036 2.json	1	0	Optimal	0.02	75	75.00	0.00
j6036 3.json	1	0	Optimal	0.03	81	81.00	0.00
j6036 4.json	1	0	Optimal	0.02	85	85.00	0.00
j6036 5.json	1	0	Optimal	0.02	57	57.00	0.00
j6036 6.json	1	0	Optimal	0.02	76	76.00	0.00
j6036 7.json	1	0	Optimal	0.02	71	71.00	0.00
j6036 8.json	1	0	Optimal	0.02	69	69.00	0.00
j6036 9.json	1	0	Optimal	0.02	86	86.00	0.00
j6037 1.json	1	0	Optimal	2.54	97	97.00	0.00
j6037 10.json	1	0	Optimal	0.52	96	96.00	0.00
j6037 2.json	1	0	Optimal	3.65	95	95.00	0.00
j6037 3.json	1	0	Optimal	1.87	139	139.00	0.00
j6037 4.json	1	0	Optimal	0.64	101	101.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6037 5.json	1	0	Optimal	0.94	98	98.00	0.00
j6037 6.json	1	0	Optimal	21.45	102	102.00	0.00
j6037 7.json	1	0	Optimal	5.92	110	110.00	0.00
j6037 8.json	1	0	Optimal	0.76	93	93.00	0.00
j6037 9.json	1	0	Optimal	1.49	96	96.00	0.00
j6038 1.json	1	0	Optimal	0.02	73	73.00	0.00
j6038 10.json	1	0	Optimal	0.19	66	66.00	0.00
j6038 2.json	1	0	Optimal	1.51	76	76.00	0.00
j6038 3.json	1	0	Optimal	0.04	77	77.00	0.00
j6038 4.json	1	0	Optimal	0.03	58	58.00	0.00
j6038 5.json	1	0	Optimal	0.02	103	103.00	0.00
j6038 6.json	1	0	Optimal	0.02	86	86.00	0.00
j6038 7.json	1	0	Optimal	0.02	74	74.00	0.00
j6038 8.json	1	0	Optimal	0.06	71	71.00	0.00
j6038 9.json	1	0	Optimal	0.03	66	66.00	0.00
j6039 1.json	1	0	Optimal	0.03	80	80.00	0.00
j6039 10.json	1	0	Optimal	0.03	74	74.00	0.00
j6039 2.json	1	0	Optimal	0.02	84	84.00	0.00
j6039 3.json	1	0	Optimal	0.03	83	83.00	0.00
j6039 4.json	1	0	Optimal	0.02	92	92.00	0.00
j6039 5.json	1	0	Optimal	0.02	73	73.00	0.00
j6039 6.json	1	0	Optimal	0.02	84	84.00	0.00
j6039 7.json	1	0	Optimal	0.02	68	68.00	0.00
j6039 8.json	1	0	Optimal	0.02	77	77.00	0.00
j6039 9.json	1	0	Optimal	0.02	72	72.00	0.00
j603 1.json	1	0	Optimal	0.02	60	60.00	0.00
j603 10.json	1	0	Optimal	0.02	69	69.00	0.00
j603 2.json	1	0	Optimal	0.02	69	69.00	0.00
j603 3.json	1	0	Optimal	0.02	105	105.00	0.00
j603 4.json	1	0	Optimal	0.02	81	81.00	0.00
j603 5.json	1	0	Optimal	0.02	83	83.00	0.00
j603 6.json	1	0	Optimal	0.02	57	57.00	0.00
j603 7.json	1	0	Optimal	0.02	59	59.00	0.00
j603 8.json	1	0	Optimal	0.09	55	55.00	0.00
j603 9.json	1	0	Optimal	0.02	67	67.00	0.00
j6040 1.json	1	0	Optimal	0.02	86	86.00	0.00
j6040 10.json	1	0	Optimal	0.02	73	73.00	0.00
j6040 2.json	1	0	Optimal	0.02	81	81.00	0.00
j6040 3.json	1	0	Optimal	0.02	70	70.00	0.00
j6040 4.json	1	0	Optimal	0.02	87	87.00	0.00
j6040 5.json	1	0	Optimal	0.02	83	83.00	0.00
j6040 6.json	1	0	Optimal	0.03	69	69.00	0.00
j6040 7.json	1	0	Optimal	0.02	68	68.00	0.00
j6040 8.json	1	0	Optimal	0.02	80	80.00	0.00
j6040 9.json	1	0	Optimal	0.02	90	90.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6041 1.json	1	0	Optimal	40.76	122	122.00	0.00
j6041 10.json	1	0	Solution	600.01	111	108.00	2.70
j6041 2.json	1	0	Optimal	31.96	113	113.00	0.00
j6041 3.json	1	0	Solution	600.01	99	89.00	10.10
j6041 4.json	1	0	Optimal	8.26	133	133.00	0.00
j6041 5.json	1	0	Solution	600.01	117	101.00	13.68
j6041 6.json	1	0	Optimal	65.80	134	134.00	0.00
j6041 7.json	1	0	Optimal	18.86	132	132.00	0.00
j6041 8.json	1	0	Optimal	21.69	135	135.00	0.00
j6041 9.json	1	0	Optimal	35.00	131	131.00	0.00
j6042 1.json	1	0	Optimal	0.02	83	83.00	0.00
j6042 10.json	1	0	Optimal	0.02	87	87.00	0.00
j6042 2.json	1	0	Optimal	0.02	68	68.00	0.00
j6042 3.json	1	0	Optimal	4.44	78	78.00	0.00
j6042 4.json	1	0	Optimal	0.56	103	103.00	0.00
j6042 5.json	1	0	Optimal	0.02	73	73.00	0.00
j6042 6.json	1	0	Optimal	0.02	82	82.00	0.00
j6042 7.json	1	0	Optimal	2.18	59	59.00	0.00
j6042 8.json	1	0	Optimal	0.78	82	82.00	0.00
j6042 9.json	1	0	Optimal	0.03	71	71.00	0.00
j6043 1.json	1	0	Optimal	0.02	108	108.00	0.00
j6043 10.json	1	0	Optimal	0.02	78	78.00	0.00
j6043 2.json	1	0	Optimal	0.03	85	85.00	0.00
j6043 3.json	1	0	Optimal	0.02	74	74.00	0.00
j6043 4.json	1	0	Optimal	0.02	75	75.00	0.00
j6043 5.json	1	0	Optimal	0.02	64	64.00	0.00
j6043 6.json	1	0	Optimal	0.03	84	84.00	0.00
j6043 7.json	1	0	Optimal	0.03	89	89.00	0.00
j6043 8.json	1	0	Optimal	0.02	69	69.00	0.00
j6043 9.json	1	0	Optimal	0.02	70	70.00	0.00
j6044 1.json	1	0	Optimal	0.03	84	84.00	0.00
j6044 10.json	1	0	Optimal	0.02	65	65.00	0.00
j6044 2.json	1	0	Optimal	0.02	68	68.00	0.00
j6044 3.json	1	0	Optimal	0.02	87	87.00	0.00
j6044 4.json	1	0	Optimal	0.02	77	77.00	0.00
j6044 5.json	1	0	Optimal	0.03	74	74.00	0.00
j6044 6.json	1	0	Optimal	0.02	81	81.00	0.00
j6044 7.json	1	0	Optimal	0.02	76	76.00	0.00
j6044 8.json	1	0	Optimal	0.02	83	83.00	0.00
j6044 9.json	1	0	Optimal	0.02	65	65.00	0.00
j6045 1.json	1	0	Solution	600.01	96	89.00	7.29
j6045 10.json	1	0	Solution	600.01	115	104.00	9.57
j6045 2.json	1	0	Solution	600.01	144	122.00	15.28
j6045 3.json	1	0	Solution	600.01	144	130.00	9.72
j6045 4.json	1	0	Solution	600.01	109	100.00	8.26

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6045 5.json	1	0	Solution	600.01	106	100.00	5.66
j6045 6.json	1	0	Solution	600.01	145	129.00	11.03
j6045 7.json	1	0	Solution	600.01	122	110.00	9.84
j6045 8.json	1	0	Solution	600.01	130	112.00	13.85
j6045 9.json	1	0	Solution	600.02	124	111.00	10.48
j6046 1.json	1	0	Optimal	0.90	79	78.00	1.27
j6046 10.json	1	0	Optimal	135.10	88	88.00	0.00
j6046 2.json	1	0	Optimal	0.02	78	78.00	0.00
j6046 3.json	1	0	Optimal	1.54	79	79.00	0.00
j6046 4.json	1	0	Optimal	32.94	74	74.00	0.00
j6046 5.json	1	0	Optimal	17.77	91	91.00	0.00
j6046 6.json	1	0	Optimal	8.76	90	90.00	0.00
j6046 7.json	1	0	Optimal	67.16	78	78.00	0.00
j6046 8.json	1	0	Optimal	1.25	75	75.00	0.00
j6046 9.json	1	0	Optimal	314.39	69	69.00	0.00
j6047 1.json	1	0	Optimal	0.02	75	75.00	0.00
j6047 10.json	1	0	Optimal	0.02	66	66.00	0.00
j6047 2.json	1	0	Optimal	0.03	66	66.00	0.00
j6047 3.json	1	0	Optimal	0.02	69	69.00	0.00
j6047 4.json	1	0	Optimal	0.02	76	76.00	0.00
j6047 5.json	1	0	Optimal	0.02	87	87.00	0.00
j6047 6.json	1	0	Optimal	0.02	76	76.00	0.00
j6047 7.json	1	0	Optimal	0.02	68	68.00	0.00
j6047 8.json	1	0	Optimal	0.03	71	71.00	0.00
j6047 9.json	1	0	Optimal	0.02	76	76.00	0.00
j6048 1.json	1	0	Optimal	0.02	71	71.00	0.00
j6048 10.json	1	0	Optimal	0.02	70	70.00	0.00
j6048 2.json	1	0	Optimal	0.02	87	87.00	0.00
j6048 3.json	1	0	Optimal	0.02	84	84.00	0.00
j6048 4.json	1	0	Optimal	0.03	62	62.00	0.00
j6048 5.json	1	0	Optimal	0.02	101	101.00	0.00
j6048 6.json	1	0	Optimal	0.03	66	66.00	0.00
j6048 7.json	1	0	Optimal	0.03	77	77.00	0.00
j6048 8.json	1	0	Optimal	0.03	88	88.00	0.00
j6048 9.json	1	0	Optimal	0.03	82	82.00	0.00
j604 1.json	1	0	Optimal	0.02	84	84.00	0.00
j604 10.json	1	0	Optimal	0.02	77	77.00	0.00
j604 2.json	1	0	Optimal	0.02	60	60.00	0.00
j604 3.json	1	0	Optimal	0.02	58	58.00	0.00
j604 4.json	1	0	Optimal	0.02	65	65.00	0.00
j604 5.json	1	0	Optimal	0.02	75	75.00	0.00
j604 6.json	1	0	Optimal	0.02	71	71.00	0.00
j604 7.json	1	0	Optimal	0.02	67	67.00	0.00
j604 8.json	1	0	Optimal	0.02	65	65.00	0.00
j604 9.json	1	0	Optimal	0.02	75	75.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j605 1.json	1	0	Optimal	5.94	76	76.00	0.00
j605 10.json	1	0	Optimal	25.80	81	81.00	0.00
j605 2.json	1	0	Optimal	4.69	106	106.00	0.00
j605 3.json	1	0	Optimal	2.77	80	80.00	0.00
j605 4.json	1	0	Optimal	5.12	72	72.00	0.00
j605 5.json	1	0	Optimal	2.27	108	108.00	0.00
j605 6.json	1	0	Optimal	0.92	74	74.00	0.00
j605 7.json	1	0	Optimal	11.15	75	75.00	0.00
j605 8.json	1	0	Optimal	0.64	78	76.00	2.56
j605 9.json	1	0	Optimal	0.44	83	83.00	0.00
j606 1.json	1	0	Optimal	0.02	60	60.00	0.00
j606 10.json	1	0	Optimal	0.02	74	74.00	0.00
j606 2.json	1	0	Optimal	0.03	67	67.00	0.00
j606 3.json	1	0	Optimal	0.02	72	72.00	0.00
j606 4.json	1	0	Optimal	0.02	67	67.00	0.00
j606 5.json	1	0	Optimal	0.02	78	78.00	0.00
j606 6.json	1	0	Optimal	0.31	55	55.00	0.00
j606 7.json	1	0	Optimal	0.02	61	61.00	0.00
j606 8.json	1	0	Optimal	0.02	72	72.00	0.00
j606 9.json	1	0	Optimal	0.02	64	64.00	0.00
j607 1.json	1	0	Optimal	0.02	77	77.00	0.00
j607 10.json	1	0	Optimal	0.02	82	82.00	0.00
j607 2.json	1	0	Optimal	0.02	85	85.00	0.00
j607 3.json	1	0	Optimal	0.02	62	62.00	0.00
j607 4.json	1	0	Optimal	0.02	63	63.00	0.00
j607 5.json	1	0	Optimal	0.02	71	71.00	0.00
j607 6.json	1	0	Optimal	0.02	65	65.00	0.00
j607 7.json	1	0	Optimal	0.02	89	89.00	0.00
j607 8.json	1	0	Optimal	0.02	66	66.00	0.00
j607 9.json	1	0	Optimal	0.02	44	44.00	0.00
j608 1.json	1	0	Optimal	0.02	64	64.00	0.00
j608 10.json	1	0	Optimal	0.02	97	97.00	0.00
j608 2.json	1	0	Optimal	0.02	61	61.00	0.00
j608 3.json	1	0	Optimal	0.02	79	79.00	0.00
j608 4.json	1	0	Optimal	0.02	64	64.00	0.00
j608 5.json	1	0	Optimal	0.02	83	83.00	0.00
j608 6.json	1	0	Optimal	0.02	56	56.00	0.00
j608 7.json	1	0	Optimal	0.02	62	62.00	0.00
j608 8.json	1	0	Optimal	0.02	66	66.00	0.00
j608 9.json	1	0	Optimal	0.02	58	58.00	0.00
j609 1.json	1	0	Solution	600.01	87	85.00	2.30
j609 10.json	1	0	Solution	600.02	95	90.00	5.26
j609 2.json	1	0	Optimal	173.20	82	82.00	0.00
j609 3.json	1	0	Solution	600.01	101	93.00	7.92
j609 4.json	1	0	Optimal	19.41	87	87.00	0.00

Table 9.3: Results for RCPSP J60 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j609 5.json	1	0	Solution	600.01	87	81.00	6.90
j609 6.json	1	0	Solution	600.01	112	104.00	7.14
j609 7.json	1	0	Solution	600.01	111	104.00	6.31
j609 8.json	1	0	Solution	600.03	96	90.00	6.25
j609 9.json	1	0	Solution	600.06	99	98.00	1.01

9.2.2 CPSat

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6010 1.json	1	0	Optimal	0.10	85	85.00	0.00
j6010 10.json	1	0	Optimal	0.03	73	73.00	0.00
j6010 2.json	1	0	Optimal	0.05	62	62.00	0.00
j6010 3.json	1	0	Optimal	0.04	72	72.00	0.00
j6010 4.json	1	0	Optimal	0.07	80	80.00	0.00
j6010 5.json	1	0	Optimal	0.07	79	79.00	0.00
j6010 6.json	1	0	Optimal	0.07	67	67.00	0.00
j6010 7.json	1	0	Optimal	0.06	69	69.00	0.00
j6010 8.json	1	0	Optimal	0.07	65	65.00	0.00
j6010 9.json	1	0	Optimal	0.10	73	73.00	0.00
j6011 1.json	1	0	Optimal	0.03	71	71.00	0.00
j6011 10.json	1	0	Optimal	0.02	58	58.00	0.00
j6011 2.json	1	0	Optimal	0.04	61	61.00	0.00
j6011 3.json	1	0	Optimal	0.05	76	76.00	0.00
j6011 4.json	1	0	Optimal	0.07	69	69.00	0.00
j6011 5.json	1	0	Optimal	0.03	65	65.00	0.00
j6011 6.json	1	0	Optimal	0.03	70	70.00	0.00
j6011 7.json	1	0	Optimal	0.02	70	70.00	0.00
j6011 8.json	1	0	Optimal	0.03	69	69.00	0.00
j6011 9.json	1	0	Optimal	0.03	62	62.00	0.00
j6012 1.json	1	0	Optimal	0.03	59	59.00	0.00
j6012 10.json	1	0	Optimal	0.02	79	79.00	0.00
j6012 2.json	1	0	Optimal	0.02	58	58.00	0.00
j6012 3.json	1	0	Optimal	0.04	75	75.00	0.00
j6012 4.json	1	0	Optimal	0.03	69	69.00	0.00
j6012 5.json	1	0	Optimal	0.03	63	63.00	0.00
j6012 6.json	1	0	Optimal	0.02	54	54.00	0.00
j6012 7.json	1	0	Optimal	0.03	71	71.00	0.00
j6012 8.json	1	0	Optimal	0.02	60	60.00	0.00
j6012 9.json	1	0	Optimal	0.02	59	59.00	0.00
j6013 1.json	1	0	Solution	600.98	113	104.00	7.96

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6013 10.json	1	0	Solution	600.25	120	112.00	6.67
j6013 2.json	1	0	Solution	600.19	107	102.00	4.67
j6013 3.json	1	0	Solution	600.14	91	83.00	8.79
j6013 4.json	1	0	Solution	600.21	105	97.00	7.62
j6013 5.json	1	0	Solution	600.17	99	91.00	8.08
j6013 6.json	1	0	Solution	601.31	96	91.00	5.21
j6013 7.json	1	0	Solution	600.15	89	81.00	8.99
j6013 8.json	1	0	Solution	600.18	122	114.00	6.56
j6013 9.json	1	0	Solution	600.34	103	95.00	7.77
j6014 1.json	1	0	Optimal	595.18	61	61.00	0.00
j6014 10.json	1	0	Optimal	600.02	72	72.00	0.00
j6014 2.json	1	0	Optimal	0.07	65	65.00	0.00
j6014 3.json	1	0	Optimal	600.01	61	61.00	0.00
j6014 4.json	1	0	Optimal	19.55	65	65.00	0.00
j6014 5.json	1	0	Optimal	0.04	59	59.00	0.00
j6014 6.json	1	0	Optimal	0.06	65	65.00	0.00
j6014 7.json	1	0	Optimal	0.06	69	69.00	0.00
j6014 8.json	1	0	Optimal	0.04	88	88.00	0.00
j6014 9.json	1	0	Optimal	0.04	61	61.00	0.00
j6015 1.json	1	0	Optimal	0.03	84	84.00	0.00
j6015 10.json	1	0	Optimal	0.03	61	61.00	0.00
j6015 2.json	1	0	Optimal	0.04	89	89.00	0.00
j6015 3.json	1	0	Optimal	0.03	72	72.00	0.00
j6015 4.json	1	0	Optimal	0.05	75	75.00	0.00
j6015 5.json	1	0	Optimal	0.03	70	70.00	0.00
j6015 6.json	1	0	Optimal	0.02	76	76.00	0.00
j6015 7.json	1	0	Optimal	0.02	64	64.00	0.00
j6015 8.json	1	0	Optimal	0.03	79	79.00	0.00
j6015 9.json	1	0	Optimal	0.02	72	72.00	0.00
j6016 1.json	1	0	Optimal	0.02	64	64.00	0.00
j6016 10.json	1	0	Optimal	0.03	68	68.00	0.00
j6016 2.json	1	0	Optimal	0.02	64	64.00	0.00
j6016 3.json	1	0	Optimal	0.03	53	53.00	0.00
j6016 4.json	1	0	Optimal	0.03	60	60.00	0.00
j6016 5.json	1	0	Optimal	0.03	66	66.00	0.00
j6016 6.json	1	0	Optimal	0.03	66	66.00	0.00
j6016 7.json	1	0	Optimal	0.02	82	82.00	0.00
j6016 8.json	1	0	Optimal	0.03	68	68.00	0.00
j6016 9.json	1	0	Optimal	0.03	54	54.00	0.00
j6017 1.json	1	0	Optimal	0.04	86	86.00	0.00
j6017 10.json	1	0	Optimal	0.04	72	72.00	0.00
j6017 2.json	1	0	Optimal	0.06	69	69.00	0.00
j6017 3.json	1	0	Optimal	0.07	89	89.00	0.00
j6017 4.json	1	0	Optimal	0.04	71	71.00	0.00
j6017 5.json	1	0	Optimal	0.06	59	59.00	0.00

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6017 6.json	1	0	Optimal	0.06	69	69.00	0.00
j6017 7.json	1	0	Optimal	0.06	83	83.00	0.00
j6017 8.json	1	0	Optimal	0.09	85	85.00	0.00
j6017 9.json	1	0	Optimal	0.04	76	76.00	0.00
j6018 1.json	1	0	Optimal	0.05	81	81.00	0.00
j6018 10.json	1	0	Optimal	0.04	97	97.00	0.00
j6018 2.json	1	0	Optimal	0.03	69	69.00	0.00
j6018 3.json	1	0	Optimal	0.02	77	77.00	0.00
j6018 4.json	1	0	Optimal	0.06	71	71.00	0.00
j6018 5.json	1	0	Optimal	0.03	80	80.00	0.00
j6018 6.json	1	0	Optimal	0.04	61	61.00	0.00
j6018 7.json	1	0	Optimal	0.03	93	93.00	0.00
j6018 8.json	1	0	Optimal	0.04	78	78.00	0.00
j6018 9.json	1	0	Optimal	0.04	69	69.00	0.00
j6019 1.json	1	0	Optimal	0.04	62	62.00	0.00
j6019 10.json	1	0	Optimal	0.03	78	78.00	0.00
j6019 2.json	1	0	Optimal	0.02	83	83.00	0.00
j6019 3.json	1	0	Optimal	0.03	83	83.00	0.00
j6019 4.json	1	0	Optimal	0.03	67	67.00	0.00
j6019 5.json	1	0	Optimal	0.03	73	73.00	0.00
j6019 6.json	1	0	Optimal	0.03	69	69.00	0.00
j6019 7.json	1	0	Optimal	0.02	60	60.00	0.00
j6019 8.json	1	0	Optimal	0.03	87	87.00	0.00
j6019 9.json	1	0	Optimal	0.06	69	69.00	0.00
j601 1.json	1	0	Optimal	0.06	77	77.00	0.00
j601 10.json	1	0	Optimal	0.04	80	80.00	0.00
j601 2.json	1	0	Optimal	0.04	68	68.00	0.00
j601 3.json	1	0	Optimal	0.07	68	68.00	0.00
j601 4.json	1	0	Optimal	0.04	91	91.00	0.00
j601 5.json	1	0	Optimal	0.12	73	73.00	0.00
j601 6.json	1	0	Optimal	0.11	66	66.00	0.00
j601 7.json	1	0	Optimal	0.11	72	72.00	0.00
j601 8.json	1	0	Optimal	0.07	75	75.00	0.00
j601 9.json	1	0	Optimal	0.11	85	85.00	0.00
j6020 1.json	1	0	Optimal	0.03	60	60.00	0.00
j6020 10.json	1	0	Optimal	0.03	70	70.00	0.00
j6020 2.json	1	0	Optimal	0.03	78	78.00	0.00
j6020 3.json	1	0	Optimal	0.03	69	69.00	0.00
j6020 4.json	1	0	Optimal	0.03	86	86.00	0.00
j6020 5.json	1	0	Optimal	0.03	71	71.00	0.00
j6020 6.json	1	0	Optimal	0.02	97	97.00	0.00
j6020 7.json	1	0	Optimal	0.03	74	74.00	0.00
j6020 8.json	1	0	Optimal	0.03	65	65.00	0.00
j6020 9.json	1	0	Optimal	0.03	74	74.00	0.00
j6021 1.json	1	0	Optimal	1.09	103	103.00	0.00

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6021 10.json	1	0	Optimal	0.47	80	80.00	0.00
j6021 2.json	1	0	Optimal	0.32	108	108.00	0.00
j6021 3.json	1	0	Optimal	0.82	87	87.00	0.00
j6021 4.json	1	0	Optimal	2.42	95	95.00	0.00
j6021 5.json	1	0	Optimal	2.05	89	89.00	0.00
j6021 6.json	1	0	Optimal	1.23	84	84.00	0.00
j6021 7.json	1	0	Optimal	0.58	103	103.00	0.00
j6021 8.json	1	0	Optimal	1.48	110	110.00	0.00
j6021 9.json	1	0	Optimal	31.08	89	89.00	0.00
j6022 1.json	1	0	Optimal	0.05	64	64.00	0.00
j6022 10.json	1	0	Optimal	0.06	70	70.00	0.00
j6022 2.json	1	0	Optimal	0.09	83	83.00	0.00
j6022 3.json	1	0	Optimal	0.10	70	70.00	0.00
j6022 4.json	1	0	Optimal	0.10	73	73.00	0.00
j6022 5.json	1	0	Optimal	0.06	76	76.00	0.00
j6022 6.json	1	0	Optimal	0.04	79	79.00	0.00
j6022 7.json	1	0	Optimal	0.06	69	69.00	0.00
j6022 8.json	1	0	Optimal	0.06	59	59.00	0.00
j6022 9.json	1	0	Optimal	0.06	65	65.00	0.00
j6023 1.json	1	0	Optimal	0.03	75	75.00	0.00
j6023 10.json	1	0	Optimal	0.05	68	68.00	0.00
j6023 2.json	1	0	Optimal	0.03	69	69.00	0.00
j6023 3.json	1	0	Optimal	0.03	78	78.00	0.00
j6023 4.json	1	0	Optimal	0.04	83	83.00	0.00
j6023 5.json	1	0	Optimal	0.04	72	72.00	0.00
j6023 6.json	1	0	Optimal	0.04	81	81.00	0.00
j6023 7.json	1	0	Optimal	0.03	60	60.00	0.00
j6023 8.json	1	0	Optimal	0.02	72	72.00	0.00
j6023 9.json	1	0	Optimal	0.04	64	64.00	0.00
j6024 1.json	1	0	Optimal	0.02	65	65.00	0.00
j6024 10.json	1	0	Optimal	0.03	66	66.00	0.00
j6024 2.json	1	0	Optimal	0.03	55	55.00	0.00
j6024 3.json	1	0	Optimal	0.03	67	67.00	0.00
j6024 4.json	1	0	Optimal	0.02	78	78.00	0.00
j6024 5.json	1	0	Optimal	0.03	76	76.00	0.00
j6024 6.json	1	0	Optimal	0.02	75	75.00	0.00
j6024 7.json	1	0	Optimal	0.03	68	68.00	0.00
j6024 8.json	1	0	Optimal	0.02	81	81.00	0.00
j6024 9.json	1	0	Optimal	0.03	80	80.00	0.00
j6025 1.json	1	0	Optimal	600.03	114	114.00	0.00
j6025 10.json	1	0	Optimal	586.36	108	108.00	0.00
j6025 2.json	1	0	Solution	601.75	99	91.00	8.08
j6025 3.json	1	0	Optimal	67.98	113	113.00	0.00
j6025 4.json	1	0	Solution	600.30	108	100.00	7.41
j6025 5.json	1	0	Optimal	600.02	98	98.00	0.00

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6025 6.json	1	0	Solution	600.18	113	102.00	9.73
j6025 7.json	1	0	Solution	601.43	90	84.00	6.67
j6025 8.json	1	0	Solution	601.73	99	92.00	7.07
j6025 9.json	1	0	Optimal	160.54	99	99.00	0.00
j6026 1.json	1	0	Optimal	0.08	80	80.00	0.00
j6026 10.json	1	0	Optimal	0.06	85	85.00	0.00
j6026 2.json	1	0	Optimal	0.10	66	66.00	0.00
j6026 3.json	1	0	Optimal	0.34	76	76.00	0.00
j6026 4.json	1	0	Optimal	1.99	67	67.00	0.00
j6026 5.json	1	0	Optimal	0.07	61	61.00	0.00
j6026 6.json	1	0	Optimal	0.09	74	74.00	0.00
j6026 7.json	1	0	Optimal	0.07	72	72.00	0.00
j6026 8.json	1	0	Optimal	0.07	89	89.00	0.00
j6026 9.json	1	0	Optimal	0.29	65	65.00	0.00
j6027 1.json	1	0	Optimal	0.03	96	96.00	0.00
j6027 10.json	1	0	Optimal	0.03	57	57.00	0.00
j6027 2.json	1	0	Optimal	0.04	74	74.00	0.00
j6027 3.json	1	0	Optimal	0.07	76	76.00	0.00
j6027 4.json	1	0	Optimal	0.03	60	60.00	0.00
j6027 5.json	1	0	Optimal	0.02	78	78.00	0.00
j6027 6.json	1	0	Optimal	0.04	64	64.00	0.00
j6027 7.json	1	0	Optimal	0.02	83	83.00	0.00
j6027 8.json	1	0	Optimal	0.04	88	88.00	0.00
j6027 9.json	1	0	Optimal	0.03	76	76.00	0.00
j6028 1.json	1	0	Optimal	0.02	92	92.00	0.00
j6028 10.json	1	0	Optimal	0.02	74	74.00	0.00
j6028 2.json	1	0	Optimal	0.03	64	64.00	0.00
j6028 3.json	1	0	Optimal	0.02	72	72.00	0.00
j6028 4.json	1	0	Optimal	0.03	84	84.00	0.00
j6028 5.json	1	0	Optimal	0.02	71	71.00	0.00
j6028 6.json	1	0	Optimal	0.03	89	89.00	0.00
j6028 7.json	1	0	Optimal	0.02	75	75.00	0.00
j6028 8.json	1	0	Optimal	0.02	62	62.00	0.00
j6028 9.json	1	0	Optimal	0.02	74	74.00	0.00
j6029 1.json	1	0	Solution	601.51	106	96.00	9.43
j6029 10.json	1	0	Solution	600.22	121	110.00	9.09
j6029 2.json	1	0	Solution	600.18	135	116.00	14.07
j6029 3.json	1	0	Solution	600.48	122	113.00	7.38
j6029 4.json	1	0	Solution	601.36	137	120.00	12.41
j6029 5.json	1	0	Solution	600.19	111	100.00	9.91
j6029 6.json	1	0	Solution	601.84	156	143.00	8.33
j6029 7.json	1	0	Solution	601.58	124	113.00	8.87
j6029 8.json	1	0	Solution	600.20	104	95.00	8.65
j6029 9.json	1	0	Solution	600.18	113	100.00	11.50
j602 1.json	1	0	Optimal	0.04	65	65.00	0.00

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j602 10.json	1	0	Optimal	0.04	69	69.00	0.00
j602 2.json	1	0	Optimal	0.04	82	82.00	0.00
j602 3.json	1	0	Optimal	0.04	78	78.00	0.00
j602 4.json	1	0	Optimal	0.06	78	78.00	0.00
j602 5.json	1	0	Optimal	0.04	54	54.00	0.00
j602 6.json	1	0	Optimal	0.04	64	64.00	0.00
j602 7.json	1	0	Optimal	0.03	53	53.00	0.00
j602 8.json	1	0	Optimal	0.06	66	66.00	0.00
j602 9.json	1	0	Optimal	0.04	65	65.00	0.00
j6030 1.json	1	0	Optimal	0.07	70	70.00	0.00
j6030 10.json	1	0	Optimal	600.01	86	86.00	0.00
j6030 2.json	1	0	Solution	600.28	70	68.00	2.86
j6030 3.json	1	0	Optimal	0.08	82	82.00	0.00
j6030 4.json	1	0	Optimal	0.02	76	76.00	0.00
j6030 5.json	1	0	Optimal	600.02	76	76.00	0.00
j6030 6.json	1	0	Optimal	0.07	68	68.00	0.00
j6030 7.json	1	0	Optimal	600.03	86	86.00	0.00
j6030 8.json	1	0	Optimal	0.05	63	63.00	0.00
j6030 9.json	1	0	Optimal	0.09	98	98.00	0.00
j6031 1.json	1	0	Optimal	0.03	65	65.00	0.00
j6031 10.json	1	0	Optimal	0.03	56	56.00	0.00
j6031 2.json	1	0	Optimal	0.02	74	74.00	0.00
j6031 3.json	1	0	Optimal	0.03	66	66.00	0.00
j6031 4.json	1	0	Optimal	0.02	68	68.00	0.00
j6031 5.json	1	0	Optimal	0.02	72	72.00	0.00
j6031 6.json	1	0	Optimal	0.03	72	72.00	0.00
j6031 7.json	1	0	Optimal	0.03	76	76.00	0.00
j6031 8.json	1	0	Optimal	0.03	75	75.00	0.00
j6031 9.json	1	0	Optimal	0.04	86	86.00	0.00
j6032 1.json	1	0	Optimal	0.03	69	69.00	0.00
j6032 10.json	1	0	Optimal	0.03	77	77.00	0.00
j6032 2.json	1	0	Optimal	0.02	114	114.00	0.00
j6032 3.json	1	0	Optimal	0.03	85	85.00	0.00
j6032 4.json	1	0	Optimal	0.02	56	56.00	0.00
j6032 5.json	1	0	Optimal	0.03	77	77.00	0.00
j6032 6.json	1	0	Optimal	0.02	93	93.00	0.00
j6032 7.json	1	0	Optimal	0.02	76	76.00	0.00
j6032 8.json	1	0	Optimal	0.03	76	76.00	0.00
j6032 9.json	1	0	Optimal	0.02	74	74.00	0.00
j6033 1.json	1	0	Optimal	0.06	105	105.00	0.00
j6033 10.json	1	0	Optimal	0.07	84	84.00	0.00
j6033 2.json	1	0	Optimal	0.04	100	100.00	0.00
j6033 3.json	1	0	Optimal	0.04	79	79.00	0.00
j6033 4.json	1	0	Optimal	0.07	81	81.00	0.00
j6033 5.json	1	0	Optimal	0.04	108	108.00	0.00

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6033 6.json	1	0	Optimal	0.07	75	75.00	0.00
j6033 7.json	1	0	Optimal	0.12	78	78.00	0.00
j6033 8.json	1	0	Optimal	0.11	79	79.00	0.00
j6033 9.json	1	0	Optimal	0.06	108	108.00	0.00
j6034 1.json	1	0	Optimal	0.04	72	72.00	0.00
j6034 10.json	1	0	Optimal	0.04	92	92.00	0.00
j6034 2.json	1	0	Optimal	0.03	68	68.00	0.00
j6034 3.json	1	0	Optimal	0.06	61	61.00	0.00
j6034 4.json	1	0	Optimal	0.03	83	83.00	0.00
j6034 5.json	1	0	Optimal	0.03	80	80.00	0.00
j6034 6.json	1	0	Optimal	0.04	81	81.00	0.00
j6034 7.json	1	0	Optimal	0.04	85	85.00	0.00
j6034 8.json	1	0	Optimal	0.04	63	63.00	0.00
j6034 9.json	1	0	Optimal	0.03	77	77.00	0.00
j6035 1.json	1	0	Optimal	0.03	78	78.00	0.00
j6035 10.json	1	0	Optimal	0.03	71	71.00	0.00
j6035 2.json	1	0	Optimal	0.04	77	77.00	0.00
j6035 3.json	1	0	Optimal	0.04	89	89.00	0.00
j6035 4.json	1	0	Optimal	0.04	72	72.00	0.00
j6035 5.json	1	0	Optimal	0.04	76	76.00	0.00
j6035 6.json	1	0	Optimal	0.03	79	79.00	0.00
j6035 7.json	1	0	Optimal	0.03	73	73.00	0.00
j6035 8.json	1	0	Optimal	0.03	78	78.00	0.00
j6035 9.json	1	0	Optimal	0.04	76	76.00	0.00
j6036 1.json	1	0	Optimal	0.03	61	61.00	0.00
j6036 10.json	1	0	Optimal	0.03	77	77.00	0.00
j6036 2.json	1	0	Optimal	0.03	75	75.00	0.00
j6036 3.json	1	0	Optimal	0.02	81	81.00	0.00
j6036 4.json	1	0	Optimal	0.03	85	85.00	0.00
j6036 5.json	1	0	Optimal	0.02	57	57.00	0.00
j6036 6.json	1	0	Optimal	0.03	76	76.00	0.00
j6036 7.json	1	0	Optimal	0.03	71	71.00	0.00
j6036 8.json	1	0	Optimal	0.03	69	69.00	0.00
j6036 9.json	1	0	Optimal	0.02	86	86.00	0.00
j6037 1.json	1	0	Optimal	1.70	97	97.00	0.00
j6037 10.json	1	0	Optimal	0.28	96	96.00	0.00
j6037 2.json	1	0	Optimal	37.52	95	95.00	0.00
j6037 3.json	1	0	Optimal	1.52	139	139.00	0.00
j6037 4.json	1	0	Optimal	0.34	101	101.00	0.00
j6037 5.json	1	0	Optimal	1.40	98	98.00	0.00
j6037 6.json	1	0	Optimal	18.04	102	102.00	0.00
j6037 7.json	1	0	Optimal	5.39	110	110.00	0.00
j6037 8.json	1	0	Optimal	0.23	93	93.00	0.00
j6037 9.json	1	0	Optimal	0.60	96	96.00	0.00
j6038 1.json	1	0	Optimal	0.06	73	73.00	0.00

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6038 10.json	1	0	Optimal	0.06	66	66.00	0.00
j6038 2.json	1	0	Optimal	0.98	76	76.00	0.00
j6038 3.json	1	0	Optimal	0.06	77	77.00	0.00
j6038 4.json	1	0	Optimal	0.09	58	58.00	0.00
j6038 5.json	1	0	Optimal	0.06	103	103.00	0.00
j6038 6.json	1	0	Optimal	0.06	86	86.00	0.00
j6038 7.json	1	0	Optimal	0.06	74	74.00	0.00
j6038 8.json	1	0	Optimal	0.09	71	71.00	0.00
j6038 9.json	1	0	Optimal	0.09	66	66.00	0.00
j6039 1.json	1	0	Optimal	0.03	80	80.00	0.00
j6039 10.json	1	0	Optimal	0.03	74	74.00	0.00
j6039 2.json	1	0	Optimal	0.03	84	84.00	0.00
j6039 3.json	1	0	Optimal	0.03	83	83.00	0.00
j6039 4.json	1	0	Optimal	0.04	92	92.00	0.00
j6039 5.json	1	0	Optimal	0.03	73	73.00	0.00
j6039 6.json	1	0	Optimal	0.04	84	84.00	0.00
j6039 7.json	1	0	Optimal	0.03	68	68.00	0.00
j6039 8.json	1	0	Optimal	0.03	77	77.00	0.00
j6039 9.json	1	0	Optimal	0.03	72	72.00	0.00
j603 1.json	1	0	Optimal	0.02	60	60.00	0.00
j603 10.json	1	0	Optimal	0.04	69	69.00	0.00
j603 2.json	1	0	Optimal	0.03	69	69.00	0.00
j603 3.json	1	0	Optimal	0.03	105	105.00	0.00
j603 4.json	1	0	Optimal	0.03	81	81.00	0.00
j603 5.json	1	0	Optimal	0.03	83	83.00	0.00
j603 6.json	1	0	Optimal	0.05	57	57.00	0.00
j603 7.json	1	0	Optimal	0.03	59	59.00	0.00
j603 8.json	1	0	Optimal	0.04	55	55.00	0.00
j603 9.json	1	0	Optimal	0.03	67	67.00	0.00
j6040 1.json	1	0	Optimal	0.03	86	86.00	0.00
j6040 10.json	1	0	Optimal	0.03	73	73.00	0.00
j6040 2.json	1	0	Optimal	0.02	81	81.00	0.00
j6040 3.json	1	0	Optimal	0.02	70	70.00	0.00
j6040 4.json	1	0	Optimal	0.03	87	87.00	0.00
j6040 5.json	1	0	Optimal	0.03	83	83.00	0.00
j6040 6.json	1	0	Optimal	0.02	69	69.00	0.00
j6040 7.json	1	0	Optimal	0.03	68	68.00	0.00
j6040 8.json	1	0	Optimal	0.03	80	80.00	0.00
j6040 9.json	1	0	Optimal	0.02	90	90.00	0.00
j6041 1.json	1	0	Optimal	29.14	122	122.00	0.00
j6041 10.json	1	0	Solution	600.16	111	105.00	5.41
j6041 2.json	1	0	Optimal	93.30	113	113.00	0.00
j6041 3.json	1	0	Solution	600.16	98	87.00	11.22
j6041 4.json	1	0	Optimal	5.70	133	133.00	0.00
j6041 5.json	1	0	Solution	600.16	117	105.00	10.26

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6041 6.json	1	0	Optimal	34.86	134	134.00	0.00
j6041 7.json	1	0	Optimal	28.37	132	132.00	0.00
j6041 8.json	1	0	Optimal	26.60	135	135.00	0.00
j6041 9.json	1	0	Optimal	50.88	131	131.00	0.00
j6042 1.json	1	0	Optimal	0.05	83	83.00	0.00
j6042 10.json	1	0	Optimal	0.09	87	87.00	0.00
j6042 2.json	1	0	Optimal	0.07	68	68.00	0.00
j6042 3.json	1	0	Optimal	3.54	78	78.00	0.00
j6042 4.json	1	0	Optimal	0.11	103	103.00	0.00
j6042 5.json	1	0	Optimal	0.06	73	73.00	0.00
j6042 6.json	1	0	Optimal	0.10	82	82.00	0.00
j6042 7.json	1	0	Optimal	0.41	59	59.00	0.00
j6042 8.json	1	0	Optimal	0.14	82	82.00	0.00
j6042 9.json	1	0	Optimal	0.07	71	71.00	0.00
j6043 1.json	1	0	Optimal	0.08	108	108.00	0.00
j6043 10.json	1	0	Optimal	0.04	78	78.00	0.00
j6043 2.json	1	0	Optimal	0.08	85	85.00	0.00
j6043 3.json	1	0	Optimal	0.04	74	74.00	0.00
j6043 4.json	1	0	Optimal	0.04	75	75.00	0.00
j6043 5.json	1	0	Optimal	0.05	64	64.00	0.00
j6043 6.json	1	0	Optimal	0.04	84	84.00	0.00
j6043 7.json	1	0	Optimal	0.04	89	89.00	0.00
j6043 8.json	1	0	Optimal	0.02	69	69.00	0.00
j6043 9.json	1	0	Optimal	0.03	70	70.00	0.00
j6044 1.json	1	0	Optimal	0.02	84	84.00	0.00
j6044 10.json	1	0	Optimal	0.02	65	65.00	0.00
j6044 2.json	1	0	Optimal	0.02	68	68.00	0.00
j6044 3.json	1	0	Optimal	0.02	87	87.00	0.00
j6044 4.json	1	0	Optimal	0.02	77	77.00	0.00
j6044 5.json	1	0	Optimal	0.02	74	74.00	0.00
j6044 6.json	1	0	Optimal	0.02	81	81.00	0.00
j6044 7.json	1	0	Optimal	0.02	76	76.00	0.00
j6044 8.json	1	0	Optimal	0.02	83	83.00	0.00
j6044 9.json	1	0	Optimal	0.02	65	65.00	0.00
j6045 1.json	1	0	Solution	600.17	97	87.00	10.31
j6045 10.json	1	0	Solution	600.23	114	99.00	13.16
j6045 2.json	1	0	Solution	601.26	145	126.00	13.10
j6045 3.json	1	0	Solution	600.33	147	129.00	12.24
j6045 4.json	1	0	Solution	600.19	108	97.00	10.19
j6045 5.json	1	0	Solution	601.71	108	98.00	9.26
j6045 6.json	1	0	Solution	601.08	147	125.00	14.97
j6045 7.json	1	0	Solution	600.28	122	109.00	10.66
j6045 8.json	1	0	Solution	600.26	129	114.00	11.63
j6045 9.json	1	0	Solution	600.27	124	108.00	12.90
j6046 1.json	1	0	Optimal	0.10	79	79.00	0.00

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j6046 10.json	1	0	Optimal	142.88	88	88.00	0.00
j6046 2.json	1	0	Optimal	0.04	78	78.00	0.00
j6046 3.json	1	0	Optimal	0.78	79	79.00	0.00
j6046 4.json	1	0	Optimal	11.37	74	74.00	0.00
j6046 5.json	1	0	Optimal	8.15	91	91.00	0.00
j6046 6.json	1	0	Optimal	14.21	90	90.00	0.00
j6046 7.json	1	0	Optimal	119.87	78	78.00	0.00
j6046 8.json	1	0	Optimal	0.64	75	75.00	0.00
j6046 9.json	1	0	Optimal	600.02	69	69.00	0.00
j6047 1.json	1	0	Optimal	0.03	75	75.00	0.00
j6047 10.json	1	0	Optimal	0.04	66	66.00	0.00
j6047 2.json	1	0	Optimal	0.04	66	66.00	0.00
j6047 3.json	1	0	Optimal	0.05	69	69.00	0.00
j6047 4.json	1	0	Optimal	0.04	76	76.00	0.00
j6047 5.json	1	0	Optimal	0.06	87	87.00	0.00
j6047 6.json	1	0	Optimal	0.06	76	76.00	0.00
j6047 7.json	1	0	Optimal	0.04	68	68.00	0.00
j6047 8.json	1	0	Optimal	0.04	71	71.00	0.00
j6047 9.json	1	0	Optimal	0.05	76	76.00	0.00
j6048 1.json	1	0	Optimal	0.02	71	71.00	0.00
j6048 10.json	1	0	Optimal	0.02	70	70.00	0.00
j6048 2.json	1	0	Optimal	0.02	87	87.00	0.00
j6048 3.json	1	0	Optimal	0.02	84	84.00	0.00
j6048 4.json	1	0	Optimal	0.03	62	62.00	0.00
j6048 5.json	1	0	Optimal	0.03	101	101.00	0.00
j6048 6.json	1	0	Optimal	0.03	66	66.00	0.00
j6048 7.json	1	0	Optimal	0.03	77	77.00	0.00
j6048 8.json	1	0	Optimal	0.02	88	88.00	0.00
j6048 9.json	1	0	Optimal	0.02	82	82.00	0.00
j604 1.json	1	0	Optimal	0.02	84	84.00	0.00
j604 10.json	1	0	Optimal	0.03	77	77.00	0.00
j604 2.json	1	0	Optimal	0.03	60	60.00	0.00
j604 3.json	1	0	Optimal	0.03	58	58.00	0.00
j604 4.json	1	0	Optimal	0.03	65	65.00	0.00
j604 5.json	1	0	Optimal	0.03	75	75.00	0.00
j604 6.json	1	0	Optimal	0.03	71	71.00	0.00
j604 7.json	1	0	Optimal	0.03	67	67.00	0.00
j604 8.json	1	0	Optimal	0.03	65	65.00	0.00
j604 9.json	1	0	Optimal	0.03	75	75.00	0.00
j605 1.json	1	0	Optimal	46.92	76	76.00	0.00
j605 10.json	1	0	Optimal	600.03	81	81.00	0.00
j605 2.json	1	0	Optimal	18.55	106	106.00	0.00
j605 3.json	1	0	Optimal	4.17	80	80.00	0.00
j605 4.json	1	0	Optimal	49.00	72	72.00	0.00
j605 5.json	1	0	Optimal	2.75	108	108.00	0.00

Table 9.4: Results for RCPSP J60 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j605 6.json	1	0	Optimal	0.33	74	74.00	0.00
j605 7.json	1	0	Optimal	22.18	75	75.00	0.00
j605 8.json	1	0	Optimal	0.38	78	78.00	0.00
j605 9.json	1	0	Optimal	0.18	83	83.00	0.00
j606 1.json	1	0	Optimal	0.09	60	60.00	0.00
j606 10.json	1	0	Optimal	0.03	74	74.00	0.00
j606 2.json	1	0	Optimal	0.06	67	67.00	0.00
j606 3.json	1	0	Optimal	0.09	72	72.00	0.00
j606 4.json	1	0	Optimal	0.04	67	67.00	0.00
j606 5.json	1	0	Optimal	0.06	78	78.00	0.00
j606 6.json	1	0	Optimal	0.10	55	55.00	0.00
j606 7.json	1	0	Optimal	0.07	61	61.00	0.00
j606 8.json	1	0	Optimal	0.06	72	72.00	0.00
j606 9.json	1	0	Optimal	0.03	64	64.00	0.00
j607 1.json	1	0	Optimal	0.02	77	77.00	0.00
j607 10.json	1	0	Optimal	0.04	82	82.00	0.00
j607 2.json	1	0	Optimal	0.03	85	85.00	0.00
j607 3.json	1	0	Optimal	0.02	62	62.00	0.00
j607 4.json	1	0	Optimal	0.04	63	63.00	0.00
j607 5.json	1	0	Optimal	0.04	71	71.00	0.00
j607 6.json	1	0	Optimal	0.04	65	65.00	0.00
j607 7.json	1	0	Optimal	0.04	89	89.00	0.00
j607 8.json	1	0	Optimal	0.04	66	66.00	0.00
j607 9.json	1	0	Optimal	0.04	44	44.00	0.00
j608 1.json	1	0	Optimal	0.02	64	64.00	0.00
j608 10.json	1	0	Optimal	0.02	97	97.00	0.00
j608 2.json	1	0	Optimal	0.02	61	61.00	0.00
j608 3.json	1	0	Optimal	0.02	79	79.00	0.00
j608 4.json	1	0	Optimal	0.02	64	64.00	0.00
j608 5.json	1	0	Optimal	0.03	83	83.00	0.00
j608 6.json	1	0	Optimal	0.02	56	56.00	0.00
j608 7.json	1	0	Optimal	0.02	62	62.00	0.00
j608 8.json	1	0	Optimal	0.02	66	66.00	0.00
j608 9.json	1	0	Optimal	0.03	58	58.00	0.00
j609 1.json	1	0	Solution	600.21	87	84.00	3.45
j609 10.json	1	0	Solution	600.23	95	86.00	9.47
j609 2.json	1	0	Optimal	130.11	82	82.00	0.00
j609 3.json	1	0	Optimal	600.03	100	100.00	0.00
j609 4.json	1	0	Optimal	554.99	87	87.00	0.00
j609 5.json	1	0	Solution	600.19	86	80.00	6.98
j609 6.json	1	0	Solution	600.17	112	100.00	10.71
j609 7.json	1	0	Solution	600.26	111	103.00	7.21
j609 8.json	1	0	Solution	600.19	96	90.00	6.25
j609 9.json	1	0	Optimal	600.09	99	99.00	0.00

9.3 Size J90

9.3.1 CPO

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9010 1.json	1	0	Optimal	0.13	77	77.00	0.00
j9010 10.json	1	0	Optimal	0.07	75	75.00	0.00
j9010 2.json	1	0	Optimal	0.04	95	95.00	0.00
j9010 3.json	1	0	Optimal	0.03	112	112.00	0.00
j9010 4.json	1	0	Optimal	0.03	94	94.00	0.00
j9010 5.json	1	0	Optimal	0.03	78	78.00	0.00
j9010 6.json	1	0	Optimal	0.04	92	92.00	0.00
j9010 7.json	1	0	Optimal	0.04	83	83.00	0.00
j9010 8.json	1	0	Optimal	0.03	81	81.00	0.00
j9010 9.json	1	0	Optimal	0.03	88	88.00	0.00
j9011 1.json	1	0	Optimal	0.03	86	86.00	0.00
j9011 10.json	1	0	Optimal	0.03	81	81.00	0.00
j9011 2.json	1	0	Optimal	0.04	99	99.00	0.00
j9011 3.json	1	0	Optimal	0.03	69	69.00	0.00
j9011 4.json	1	0	Optimal	0.02	64	64.00	0.00
j9011 5.json	1	0	Optimal	0.03	81	81.00	0.00
j9011 6.json	1	0	Optimal	0.03	78	78.00	0.00
j9011 7.json	1	0	Optimal	0.04	95	95.00	0.00
j9011 8.json	1	0	Optimal	0.04	82	82.00	0.00
j9011 9.json	1	0	Optimal	0.03	81	81.00	0.00
j9012 1.json	1	0	Optimal	0.03	71	71.00	0.00
j9012 10.json	1	0	Optimal	0.03	86	86.00	0.00
j9012 2.json	1	0	Optimal	0.02	71	71.00	0.00
j9012 3.json	1	0	Optimal	0.03	93	93.00	0.00
j9012 4.json	1	0	Optimal	0.02	73	73.00	0.00
j9012 5.json	1	0	Optimal	0.02	83	83.00	0.00
j9012 6.json	1	0	Optimal	0.02	81	81.00	0.00
j9012 7.json	1	0	Optimal	0.03	77	77.00	0.00
j9012 8.json	1	0	Optimal	0.02	83	83.00	0.00
j9012 9.json	1	0	Optimal	0.03	77	77.00	0.00
j9013 1.json	1	0	Solution	30.01	143	128.00	10.49
j9013 10.json	1	0	Solution	30.02	123	113.00	8.13
j9013 2.json	1	0	Solution	30.02	132	119.00	9.85
j9013 3.json	1	0	Solution	30.02	110	104.00	5.45
j9013 4.json	1	0	Solution	30.02	115	109.00	5.22
j9013 5.json	1	0	Solution	30.01	117	108.00	7.69
j9013 6.json	1	0	Solution	30.01	127	117.00	7.87
j9013 7.json	1	0	Solution	30.02	127	116.00	8.66
j9013 8.json	1	0	Solution	30.01	120	113.00	5.83
j9013 9.json	1	0	Solution	30.02	127	117.00	7.87
j9014 1.json	1	0	Optimal	0.02	89	89.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9014 10.json	1	0	Optimal	0.04	85	85.00	0.00
j9014 2.json	1	0	Optimal	0.04	79	79.00	0.00
j9014 3.json	1	0	Optimal	0.03	94	94.00	0.00
j9014 4.json	1	0	Optimal	0.03	88	88.00	0.00
j9014 5.json	1	0	Optimal	0.04	84	84.00	0.00
j9014 6.json	1	0	Optimal	3.56	76	76.00	0.00
j9014 7.json	1	0	Optimal	0.03	86	86.00	0.00
j9014 8.json	1	0	Optimal	0.02	80	80.00	0.00
j9014 9.json	1	0	Optimal	0.03	112	112.00	0.00
j9015 1.json	1	0	Optimal	0.04	76	76.00	0.00
j9015 10.json	1	0	Optimal	0.03	78	78.00	0.00
j9015 2.json	1	0	Optimal	0.03	71	71.00	0.00
j9015 3.json	1	0	Optimal	0.03	82	82.00	0.00
j9015 4.json	1	0	Optimal	0.04	92	92.00	0.00
j9015 5.json	1	0	Optimal	0.04	93	93.00	0.00
j9015 6.json	1	0	Optimal	0.03	61	61.00	0.00
j9015 7.json	1	0	Optimal	0.03	82	82.00	0.00
j9015 8.json	1	0	Optimal	0.03	82	82.00	0.00
j9015 9.json	1	0	Optimal	0.04	83	83.00	0.00
j9016 1.json	1	0	Optimal	0.03	85	85.00	0.00
j9016 10.json	1	0	Optimal	0.03	71	71.00	0.00
j9016 2.json	1	0	Optimal	0.02	71	71.00	0.00
j9016 3.json	1	0	Optimal	0.03	73	73.00	0.00
j9016 4.json	1	0	Optimal	0.03	69	69.00	0.00
j9016 5.json	1	0	Optimal	0.03	71	71.00	0.00
j9016 6.json	1	0	Optimal	0.03	74	74.00	0.00
j9016 7.json	1	0	Optimal	0.03	65	65.00	0.00
j9016 8.json	1	0	Optimal	0.03	71	71.00	0.00
j9016 9.json	1	0	Optimal	0.03	66	66.00	0.00
j9017 1.json	1	0	Optimal	0.28	92	92.00	0.00
j9017 10.json	1	0	Optimal	0.47	89	89.00	0.00
j9017 2.json	1	0	Optimal	0.54	100	100.00	0.00
j9017 3.json	1	0	Optimal	0.06	89	89.00	0.00
j9017 4.json	1	0	Optimal	0.04	94	94.00	0.00
j9017 5.json	1	0	Optimal	0.02	113	113.00	0.00
j9017 6.json	1	0	Optimal	0.05	94	94.00	0.00
j9017 7.json	1	0	Optimal	0.02	80	80.00	0.00
j9017 8.json	1	0	Optimal	0.43	113	113.00	0.00
j9017 9.json	1	0	Optimal	0.32	96	96.00	0.00
j9018 1.json	1	0	Optimal	0.02	101	101.00	0.00
j9018 10.json	1	0	Optimal	0.02	94	94.00	0.00
j9018 2.json	1	0	Optimal	0.02	94	94.00	0.00
j9018 3.json	1	0	Optimal	0.01	83	83.00	0.00
j9018 4.json	1	0	Optimal	0.02	98	98.00	0.00
j9018 5.json	1	0	Optimal	0.02	90	90.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9018 6.json	1	0	Optimal	0.01	83	83.00	0.00
j9018 7.json	1	0	Optimal	0.02	73	73.00	0.00
j9018 8.json	1	0	Optimal	0.02	92	92.00	0.00
j9018 9.json	1	0	Optimal	0.02	79	79.00	0.00
j9019 1.json	1	0	Optimal	0.03	98	98.00	0.00
j9019 10.json	1	0	Optimal	0.03	85	85.00	0.00
j9019 2.json	1	0	Optimal	0.03	83	83.00	0.00
j9019 3.json	1	0	Optimal	0.01	89	89.00	0.00
j9019 4.json	1	0	Optimal	0.03	77	77.00	0.00
j9019 5.json	1	0	Optimal	0.02	66	66.00	0.00
j9019 6.json	1	0	Optimal	0.02	136	136.00	0.00
j9019 7.json	1	0	Optimal	0.02	66	66.00	0.00
j9019 8.json	1	0	Optimal	0.03	91	91.00	0.00
j9019 9.json	1	0	Optimal	0.03	121	121.00	0.00
j901 1.json	1	0	Optimal	0.46	73	73.00	0.00
j901 10.json	1	0	Optimal	0.35	90	90.00	0.00
j901 2.json	1	0	Optimal	0.02	92	92.00	0.00
j901 3.json	1	0	Optimal	0.58	66	66.00	0.00
j901 4.json	1	0	Optimal	0.77	86	86.00	0.00
j901 5.json	1	0	Optimal	0.03	87	87.00	0.00
j901 6.json	1	0	Optimal	0.31	74	74.00	0.00
j901 7.json	1	0	Optimal	0.09	91	91.00	0.00
j901 8.json	1	0	Optimal	0.21	95	95.00	0.00
j901 9.json	1	0	Optimal	0.16	72	72.00	0.00
j9020 1.json	1	0	Optimal	0.02	85	85.00	0.00
j9020 10.json	1	0	Optimal	0.03	89	89.00	0.00
j9020 2.json	1	0	Optimal	0.04	76	76.00	0.00
j9020 3.json	1	0	Optimal	0.03	86	86.00	0.00
j9020 4.json	1	0	Optimal	0.03	86	86.00	0.00
j9020 5.json	1	0	Optimal	0.02	88	88.00	0.00
j9020 6.json	1	0	Optimal	0.02	83	83.00	0.00
j9020 7.json	1	0	Optimal	0.02	82	82.00	0.00
j9020 8.json	1	0	Optimal	0.03	85	85.00	0.00
j9020 9.json	1	0	Optimal	0.02	76	76.00	0.00
j9021 1.json	1	0	Solution	30.03	114	102.00	10.53
j9021 10.json	1	0	Solution	30.02	109	105.00	3.67
j9021 2.json	1	0	Solution	30.00	117	111.00	5.13
j9021 3.json	1	0	Solution	30.01	125	119.00	4.80
j9021 4.json	1	0	Optimal	8.19	106	106.00	0.00
j9021 5.json	1	0	Solution	30.01	112	104.00	7.14
j9021 6.json	1	0	Solution	30.02	108	104.00	3.70
j9021 7.json	1	0	Solution	30.00	112	100.00	10.71
j9021 8.json	1	0	Solution	30.02	112	101.00	9.82
j9021 9.json	1	0	Solution	30.00	122	110.00	9.84
j9022 1.json	1	0	Optimal	0.03	108	108.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9022 10.json	1	0	Optimal	0.18	75	75.00	0.00
j9022 2.json	1	0	Optimal	0.02	85	85.00	0.00
j9022 3.json	1	0	Optimal	0.17	83	83.00	0.00
j9022 4.json	1	0	Optimal	0.02	96	96.00	0.00
j9022 5.json	1	0	Optimal	0.02	96	96.00	0.00
j9022 6.json	1	0	Optimal	0.03	71	71.00	0.00
j9022 7.json	1	0	Optimal	0.03	90	90.00	0.00
j9022 8.json	1	0	Optimal	0.02	97	97.00	0.00
j9022 9.json	1	0	Optimal	0.03	101	101.00	0.00
j9023 1.json	1	0	Optimal	0.03	90	90.00	0.00
j9023 10.json	1	0	Optimal	0.03	87	87.00	0.00
j9023 2.json	1	0	Optimal	0.03	84	84.00	0.00
j9023 3.json	1	0	Optimal	0.03	116	116.00	0.00
j9023 4.json	1	0	Optimal	0.03	85	85.00	0.00
j9023 5.json	1	0	Optimal	0.02	95	95.00	0.00
j9023 6.json	1	0	Optimal	0.04	87	87.00	0.00
j9023 7.json	1	0	Optimal	0.03	77	77.00	0.00
j9023 8.json	1	0	Optimal	0.03	92	92.00	0.00
j9023 9.json	1	0	Optimal	0.03	126	126.00	0.00
j9024 1.json	1	0	Optimal	0.03	84	84.00	0.00
j9024 10.json	1	0	Optimal	0.03	89	89.00	0.00
j9024 2.json	1	0	Optimal	0.03	92	92.00	0.00
j9024 3.json	1	0	Optimal	0.03	69	69.00	0.00
j9024 4.json	1	0	Optimal	0.02	81	81.00	0.00
j9024 5.json	1	0	Optimal	0.04	85	85.00	0.00
j9024 6.json	1	0	Optimal	0.02	79	79.00	0.00
j9024 7.json	1	0	Optimal	0.02	87	87.00	0.00
j9024 8.json	1	0	Optimal	0.03	88	88.00	0.00
j9024 9.json	1	0	Optimal	0.03	80	80.00	0.00
j9025 1.json	1	0	Solution	30.01	131	116.00	11.45
j9025 10.json	1	0	Solution	30.01	135	119.00	11.85
j9025 2.json	1	0	Solution	30.01	134	122.00	8.96
j9025 3.json	1	0	Solution	30.01	128	111.00	13.28
j9025 4.json	1	0	Solution	30.01	140	128.00	8.57
j9025 5.json	1	0	Solution	30.01	119	109.00	8.40
j9025 6.json	1	0	Solution	30.01	124	113.00	8.87
j9025 7.json	1	0	Solution	30.01	133	122.00	8.27
j9025 8.json	1	0	Solution	30.01	143	130.00	9.09
j9025 9.json	1	0	Solution	30.01	109	97.00	11.01
j9026 1.json	1	0	Optimal	0.02	90	90.00	0.00
j9026 10.json	1	0	Optimal	0.03	92	92.00	0.00
j9026 2.json	1	0	Optimal	0.50	85	85.00	0.00
j9026 3.json	1	0	Optimal	0.02	80	80.00	0.00
j9026 4.json	1	0	Solution	30.01	98	96.00	2.04
j9026 5.json	1	0	Solution	30.01	86	84.00	2.33

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9026 6.json	1	0	Optimal	0.03	108	108.00	0.00
j9026 7.json	1	0	Optimal	1.82	82	82.00	0.00
j9026 8.json	1	0	Solution	30.02	83	82.00	1.20
j9026 9.json	1	0	Optimal	0.05	87	87.00	0.00
j9027 1.json	1	0	Optimal	0.02	96	96.00	0.00
j9027 10.json	1	0	Optimal	0.04	97	97.00	0.00
j9027 2.json	1	0	Optimal	0.02	81	81.00	0.00
j9027 3.json	1	0	Optimal	0.03	91	91.00	0.00
j9027 4.json	1	0	Optimal	0.02	79	79.00	0.00
j9027 5.json	1	0	Optimal	0.03	99	99.00	0.00
j9027 6.json	1	0	Optimal	0.04	87	87.00	0.00
j9027 7.json	1	0	Optimal	0.01	73	73.00	0.00
j9027 8.json	1	0	Optimal	0.03	72	72.00	0.00
j9027 9.json	1	0	Optimal	0.03	84	84.00	0.00
j9028 1.json	1	0	Optimal	0.02	80	80.00	0.00
j9028 10.json	1	0	Optimal	0.03	68	68.00	0.00
j9028 2.json	1	0	Optimal	0.03	76	76.00	0.00
j9028 3.json	1	0	Optimal	0.02	86	86.00	0.00
j9028 4.json	1	0	Optimal	0.03	78	78.00	0.00
j9028 5.json	1	0	Optimal	0.02	88	88.00	0.00
j9028 6.json	1	0	Optimal	0.02	102	102.00	0.00
j9028 7.json	1	0	Optimal	0.04	97	97.00	0.00
j9028 8.json	1	0	Optimal	0.03	110	110.00	0.00
j9028 9.json	1	0	Optimal	0.02	120	120.00	0.00
j9029 1.json	1	0	Solution	30.00	138	125.00	9.42
j9029 10.json	1	0	Solution	30.02	128	118.00	7.81
j9029 2.json	1	0	Solution	30.01	132	121.00	8.33
j9029 3.json	1	0	Solution	30.02	147	135.00	8.16
j9029 4.json	1	0	Solution	30.01	153	138.00	9.80
j9029 5.json	1	0	Solution	30.01	125	115.00	8.00
j9029 6.json	1	0	Solution	30.01	127	116.00	8.66
j9029 7.json	1	0	Solution	30.01	176	156.00	11.36
j9029 8.json	1	0	Solution	30.01	160	146.00	8.75
j9029 9.json	1	0	Solution	30.01	132	119.00	9.85
j902 1.json	1	0	Optimal	0.02	96	96.00	0.00
j902 10.json	1	0	Optimal	0.02	80	80.00	0.00
j902 2.json	1	0	Optimal	0.02	114	114.00	0.00
j902 3.json	1	0	Optimal	0.02	75	75.00	0.00
j902 4.json	1	0	Optimal	0.02	70	70.00	0.00
j902 5.json	1	0	Optimal	0.02	100	100.00	0.00
j902 6.json	1	0	Optimal	0.02	67	67.00	0.00
j902 7.json	1	0	Optimal	0.03	92	92.00	0.00
j902 8.json	1	0	Optimal	0.02	82	82.00	0.00
j902 9.json	1	0	Optimal	0.03	79	79.00	0.00
j9030 1.json	1	0	Optimal	0.03	102	102.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9030 10.json	1	0	Optimal	0.03	90	90.00	0.00
j9030 2.json	1	0	Optimal	0.02	76	76.00	0.00
j9030 3.json	1	0	Optimal	0.05	102	102.00	0.00
j9030 4.json	1	0	Optimal	0.04	104	104.00	0.00
j9030 5.json	1	0	Solution	30.02	84	83.00	1.19
j9030 6.json	1	0	Optimal	0.03	90	90.00	0.00
j9030 7.json	1	0	Solution	30.01	85	84.00	1.18
j9030 8.json	1	0	Optimal	0.03	82	82.00	0.00
j9030 9.json	1	0	Solution	30.01	95	91.00	4.21
j9031 1.json	1	0	Optimal	0.02	79	79.00	0.00
j9031 10.json	1	0	Optimal	0.03	99	99.00	0.00
j9031 2.json	1	0	Optimal	0.03	69	69.00	0.00
j9031 3.json	1	0	Optimal	0.03	106	106.00	0.00
j9031 4.json	1	0	Optimal	0.03	79	79.00	0.00
j9031 5.json	1	0	Optimal	0.03	79	79.00	0.00
j9031 6.json	1	0	Optimal	0.03	80	80.00	0.00
j9031 7.json	1	0	Optimal	0.03	97	97.00	0.00
j9031 8.json	1	0	Optimal	0.03	83	83.00	0.00
j9031 9.json	1	0	Optimal	0.03	72	72.00	0.00
j9032 1.json	1	0	Optimal	0.03	78	78.00	0.00
j9032 10.json	1	0	Optimal	0.03	91	91.00	0.00
j9032 2.json	1	0	Optimal	0.03	78	78.00	0.00
j9032 3.json	1	0	Optimal	0.03	89	89.00	0.00
j9032 4.json	1	0	Optimal	0.03	104	104.00	0.00
j9032 5.json	1	0	Optimal	0.03	93	93.00	0.00
j9032 6.json	1	0	Optimal	0.03	86	86.00	0.00
j9032 7.json	1	0	Optimal	0.03	87	87.00	0.00
j9032 8.json	1	0	Optimal	0.03	79	79.00	0.00
j9032 9.json	1	0	Optimal	0.03	95	95.00	0.00
j9033 1.json	1	0	Optimal	0.30	99	99.00	0.00
j9033 10.json	1	0	Optimal	0.08	114	114.00	0.00
j9033 2.json	1	0	Optimal	0.05	112	112.00	0.00
j9033 3.json	1	0	Optimal	0.02	108	108.00	0.00
j9033 4.json	1	0	Optimal	0.08	92	92.00	0.00
j9033 5.json	1	0	Optimal	0.18	109	109.00	0.00
j9033 6.json	1	0	Optimal	0.03	88	88.00	0.00
j9033 7.json	1	0	Optimal	0.10	109	109.00	0.00
j9033 8.json	1	0	Optimal	0.17	110	110.00	0.00
j9033 9.json	1	0	Optimal	0.56	95	95.00	0.00
j9034 1.json	1	0	Optimal	0.02	83	83.00	0.00
j9034 10.json	1	0	Optimal	0.02	101	101.00	0.00
j9034 2.json	1	0	Optimal	0.02	89	89.00	0.00
j9034 3.json	1	0	Optimal	0.02	82	82.00	0.00
j9034 4.json	1	0	Optimal	0.12	81	81.00	0.00
j9034 5.json	1	0	Optimal	0.07	83	83.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9034 6.json	1	0	Optimal	0.02	89	89.00	0.00
j9034 7.json	1	0	Optimal	0.02	92	92.00	0.00
j9034 8.json	1	0	Optimal	0.02	81	81.00	0.00
j9034 9.json	1	0	Optimal	0.02	109	109.00	0.00
j9035 1.json	1	0	Optimal	0.02	98	98.00	0.00
j9035 10.json	1	0	Optimal	0.02	82	82.00	0.00
j9035 2.json	1	0	Optimal	0.02	92	92.00	0.00
j9035 3.json	1	0	Optimal	0.02	96	96.00	0.00
j9035 4.json	1	0	Optimal	0.02	86	86.00	0.00
j9035 5.json	1	0	Optimal	0.02	103	103.00	0.00
j9035 6.json	1	0	Optimal	0.02	72	72.00	0.00
j9035 7.json	1	0	Optimal	0.02	78	78.00	0.00
j9035 8.json	1	0	Optimal	0.02	85	85.00	0.00
j9035 9.json	1	0	Optimal	0.02	76	76.00	0.00
j9036 1.json	1	0	Optimal	0.02	97	97.00	0.00
j9036 10.json	1	0	Optimal	0.02	109	109.00	0.00
j9036 2.json	1	0	Optimal	0.02	114	114.00	0.00
j9036 3.json	1	0	Optimal	0.02	84	84.00	0.00
j9036 4.json	1	0	Optimal	0.03	79	79.00	0.00
j9036 5.json	1	0	Optimal	0.02	98	98.00	0.00
j9036 6.json	1	0	Optimal	0.02	99	99.00	0.00
j9036 7.json	1	0	Optimal	0.02	89	89.00	0.00
j9036 8.json	1	0	Optimal	0.02	84	84.00	0.00
j9036 9.json	1	0	Optimal	0.02	102	102.00	0.00
j9037 1.json	1	0	Solution	30.01	112	101.00	9.82
j9037 10.json	1	0	Solution	30.02	123	108.00	12.20
j9037 2.json	1	0	Solution	30.01	115	106.00	7.83
j9037 3.json	1	0	Optimal	5.87	132	132.00	0.00
j9037 4.json	1	0	Optimal	20.92	123	123.00	0.00
j9037 5.json	1	0	Solution	30.01	127	114.00	10.24
j9037 6.json	1	0	Solution	30.01	133	120.00	9.77
j9037 7.json	1	0	Optimal	9.09	123	123.00	0.00
j9037 8.json	1	0	Solution	30.01	120	106.00	11.67
j9037 9.json	1	0	Optimal	7.51	123	123.00	0.00
j9038 1.json	1	0	Optimal	0.40	85	85.00	0.00
j9038 10.json	1	0	Optimal	0.02	108	108.00	0.00
j9038 2.json	1	0	Optimal	0.03	78	78.00	0.00
j9038 3.json	1	0	Optimal	0.47	89	89.00	0.00
j9038 4.json	1	0	Optimal	0.03	89	89.00	0.00
j9038 5.json	1	0	Optimal	0.42	86	86.00	0.00
j9038 6.json	1	0	Optimal	0.07	88	88.00	0.00
j9038 7.json	1	0	Optimal	0.03	85	85.00	0.00
j9038 8.json	1	0	Optimal	0.02	91	91.00	0.00
j9038 9.json	1	0	Optimal	0.03	95	95.00	0.00
j9039 1.json	1	0	Optimal	0.02	106	106.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9039 10.json	1	0	Optimal	0.02	100	100.00	0.00
j9039 2.json	1	0	Optimal	0.02	119	119.00	0.00
j9039 3.json	1	0	Optimal	0.03	83	83.00	0.00
j9039 4.json	1	0	Optimal	0.03	81	81.00	0.00
j9039 5.json	1	0	Optimal	0.03	85	85.00	0.00
j9039 6.json	1	0	Optimal	0.02	102	102.00	0.00
j9039 7.json	1	0	Optimal	0.02	85	85.00	0.00
j9039 8.json	1	0	Optimal	0.03	81	81.00	0.00
j9039 9.json	1	0	Optimal	0.02	79	79.00	0.00
j903 1.json	1	0	Optimal	0.02	81	81.00	0.00
j903 10.json	1	0	Optimal	0.02	65	65.00	0.00
j903 2.json	1	0	Optimal	0.02	84	84.00	0.00
j903 3.json	1	0	Optimal	0.02	71	71.00	0.00
j903 4.json	1	0	Optimal	0.02	104	104.00	0.00
j903 5.json	1	0	Optimal	0.02	75	75.00	0.00
j903 6.json	1	0	Optimal	0.02	68	68.00	0.00
j903 7.json	1	0	Optimal	0.02	87	87.00	0.00
j903 8.json	1	0	Optimal	0.02	86	86.00	0.00
j903 9.json	1	0	Optimal	0.02	61	61.00	0.00
j9040 1.json	1	0	Optimal	0.02	95	95.00	0.00
j9040 10.json	1	0	Optimal	0.02	86	86.00	0.00
j9040 2.json	1	0	Optimal	0.02	91	91.00	0.00
j9040 3.json	1	0	Optimal	0.02	77	77.00	0.00
j9040 4.json	1	0	Optimal	0.02	106	106.00	0.00
j9040 5.json	1	0	Optimal	0.03	92	92.00	0.00
j9040 6.json	1	0	Optimal	0.03	86	86.00	0.00
j9040 7.json	1	0	Optimal	0.02	87	87.00	0.00
j9040 8.json	1	0	Optimal	0.03	79	79.00	0.00
j9040 9.json	1	0	Optimal	0.02	98	98.00	0.00
j9041 1.json	1	0	Solution	30.01	147	128.00	12.93
j9041 10.json	1	0	Solution	30.01	154	143.00	7.14
j9041 2.json	1	0	Solution	30.01	170	153.00	10.00
j9041 3.json	1	0	Solution	30.01	164	145.00	11.59
j9041 4.json	1	0	Solution	30.01	158	140.00	11.39
j9041 5.json	1	0	Solution	30.01	129	115.00	10.85
j9041 6.json	1	0	Solution	30.01	137	127.00	7.30
j9041 7.json	1	0	Solution	30.01	158	142.00	10.13
j9041 8.json	1	0	Solution	30.01	168	147.00	12.50
j9041 9.json	1	0	Solution	30.01	125	110.00	12.00
j9042 1.json	1	0	Optimal	0.03	106	106.00	0.00
j9042 10.json	1	0	Solution	30.01	91	89.00	2.20
j9042 2.json	1	0	Solution	30.01	103	101.00	1.94
j9042 3.json	1	0	Optimal	0.12	94	94.00	0.00
j9042 4.json	1	0	Optimal	0.03	102	102.00	0.00
j9042 5.json	1	0	Optimal	0.03	105	105.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9042 6.json	1	0	Optimal	0.03	89	89.00	0.00
j9042 7.json	1	0	Solution	30.00	87	86.00	1.15
j9042 8.json	1	0	Optimal	0.02	105	105.00	0.00
j9042 9.json	1	0	Optimal	2.78	83	83.00	0.00
j9043 1.json	1	0	Optimal	0.02	99	99.00	0.00
j9043 10.json	1	0	Optimal	0.02	92	92.00	0.00
j9043 2.json	1	0	Optimal	0.02	91	91.00	0.00
j9043 3.json	1	0	Optimal	0.01	102	102.00	0.00
j9043 4.json	1	0	Optimal	0.03	94	94.00	0.00
j9043 5.json	1	0	Optimal	0.03	98	98.00	0.00
j9043 6.json	1	0	Optimal	0.01	114	114.00	0.00
j9043 7.json	1	0	Optimal	0.02	88	88.00	0.00
j9043 8.json	1	0	Optimal	0.02	100	100.00	0.00
j9043 9.json	1	0	Optimal	0.03	88	88.00	0.00
j9044 1.json	1	0	Optimal	0.03	100	100.00	0.00
j9044 10.json	1	0	Optimal	0.03	86	86.00	0.00
j9044 2.json	1	0	Optimal	0.03	92	92.00	0.00
j9044 3.json	1	0	Optimal	0.03	110	110.00	0.00
j9044 4.json	1	0	Optimal	0.02	89	89.00	0.00
j9044 5.json	1	0	Optimal	0.03	84	84.00	0.00
j9044 6.json	1	0	Optimal	0.02	96	96.00	0.00
j9044 7.json	1	0	Optimal	0.02	93	93.00	0.00
j9044 8.json	1	0	Optimal	0.03	99	99.00	0.00
j9044 9.json	1	0	Optimal	0.03	96	96.00	0.00
j9045 1.json	1	0	Solution	30.02	151	142.00	5.96
j9045 10.json	1	0	Solution	30.01	170	156.00	8.24
j9045 2.json	1	0	Solution	30.01	150	138.00	8.00
j9045 3.json	1	0	Solution	30.01	160	142.00	11.25
j9045 4.json	1	0	Solution	30.00	139	125.00	10.07
j9045 5.json	1	0	Solution	30.00	180	163.00	9.44
j9045 6.json	1	0	Solution	30.01	178	157.00	11.80
j9045 7.json	1	0	Solution	30.02	140	127.00	9.29
j9045 8.json	1	0	Solution	30.01	163	147.00	9.82
j9045 9.json	1	0	Solution	30.02	161	141.00	12.42
j9046 1.json	1	0	Optimal	4.15	104	104.00	0.00
j9046 10.json	1	0	Optimal	0.02	114	114.00	0.00
j9046 2.json	1	0	Optimal	0.03	98	98.00	0.00
j9046 3.json	1	0	Optimal	2.76	113	113.00	0.00
j9046 4.json	1	0	Solution	30.02	93	92.00	1.08
j9046 5.json	1	0	Optimal	0.02	91	91.00	0.00
j9046 6.json	1	0	Optimal	0.05	83	83.00	0.00
j9046 7.json	1	0	Optimal	0.05	89	89.00	0.00
j9046 8.json	1	0	Solution	30.01	97	93.00	4.12
j9046 9.json	1	0	Solution	30.02	90	86.00	4.44
j9047 1.json	1	0	Optimal	0.03	82	82.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9047 10.json	1	0	Optimal	0.03	65	65.00	0.00
j9047 2.json	1	0	Optimal	0.03	90	90.00	0.00
j9047 3.json	1	0	Optimal	0.02	102	102.00	0.00
j9047 4.json	1	0	Optimal	0.03	93	93.00	0.00
j9047 5.json	1	0	Optimal	0.03	93	93.00	0.00
j9047 6.json	1	0	Optimal	0.03	98	98.00	0.00
j9047 7.json	1	0	Optimal	0.03	94	94.00	0.00
j9047 8.json	1	0	Optimal	0.03	98	98.00	0.00
j9047 9.json	1	0	Optimal	0.03	86	86.00	0.00
j9048 1.json	1	0	Optimal	0.03	83	83.00	0.00
j9048 10.json	1	0	Optimal	0.02	93	93.00	0.00
j9048 2.json	1	0	Optimal	0.02	89	89.00	0.00
j9048 3.json	1	0	Optimal	0.01	86	86.00	0.00
j9048 4.json	1	0	Optimal	0.02	91	91.00	0.00
j9048 5.json	1	0	Optimal	0.03	75	75.00	0.00
j9048 6.json	1	0	Optimal	0.03	114	114.00	0.00
j9048 7.json	1	0	Optimal	0.03	103	103.00	0.00
j9048 8.json	1	0	Optimal	0.03	74	74.00	0.00
j9048 9.json	1	0	Optimal	0.03	89	89.00	0.00
j904 1.json	1	0	Optimal	0.03	93	93.00	0.00
j904 10.json	1	0	Optimal	0.02	68	68.00	0.00
j904 2.json	1	0	Optimal	0.02	89	89.00	0.00
j904 3.json	1	0	Optimal	0.02	67	67.00	0.00
j904 4.json	1	0	Optimal	0.02	92	92.00	0.00
j904 5.json	1	0	Optimal	0.03	88	88.00	0.00
j904 6.json	1	0	Optimal	0.03	78	78.00	0.00
j904 7.json	1	0	Optimal	0.02	80	80.00	0.00
j904 8.json	1	0	Optimal	0.02	69	69.00	0.00
j904 9.json	1	0	Optimal	0.03	79	79.00	0.00
j905 1.json	1	0	Optimal	7.71	78	78.00	0.00
j905 10.json	1	0	Solution	30.01	97	94.00	3.09
j905 2.json	1	0	Optimal	12.63	93	93.00	0.00
j905 3.json	1	0	Solution	30.01	89	84.00	5.62
j905 4.json	1	0	Solution	30.01	103	98.00	4.85
j905 5.json	1	0	Solution	30.02	113	109.00	3.54
j905 6.json	1	0	Solution	30.02	88	85.00	3.41
j905 7.json	1	0	Solution	30.01	110	106.00	3.64
j905 8.json	1	0	Solution	30.01	104	95.00	8.65
j905 9.json	1	0	Solution	30.01	119	109.00	8.40
j906 1.json	1	0	Optimal	0.02	82	82.00	0.00
j906 10.json	1	0	Optimal	0.02	94	94.00	0.00
j906 2.json	1	0	Optimal	0.02	86	86.00	0.00
j906 3.json	1	0	Optimal	0.59	77	77.00	0.00
j906 4.json	1	0	Optimal	0.02	80	80.00	0.00
j906 5.json	1	0	Optimal	0.02	71	71.00	0.00

Table 9.5: Results for RCPSP J90 (CPO) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j906 6.json	1	0	Optimal	0.02	98	98.00	0.00
j906 7.json	1	0	Optimal	0.02	71	71.00	0.00
j906 8.json	1	0	Optimal	1.79	68	68.00	0.00
j906 9.json	1	0	Optimal	0.02	68	68.00	0.00
j907 1.json	1	0	Optimal	0.02	88	88.00	0.00
j907 10.json	1	0	Optimal	0.02	98	98.00	0.00
j907 2.json	1	0	Optimal	0.02	77	77.00	0.00
j907 3.json	1	0	Optimal	0.02	80	80.00	0.00
j907 4.json	1	0	Optimal	0.02	86	86.00	0.00
j907 5.json	1	0	Optimal	0.02	79	79.00	0.00
j907 6.json	1	0	Optimal	0.03	90	90.00	0.00
j907 7.json	1	0	Optimal	0.03	90	90.00	0.00
j907 8.json	1	0	Optimal	0.02	60	60.00	0.00
j907 9.json	1	0	Optimal	0.02	83	83.00	0.00
j908 1.json	1	0	Optimal	0.02	96	96.00	0.00
j908 10.json	1	0	Optimal	0.02	88	88.00	0.00
j908 2.json	1	0	Optimal	0.03	78	78.00	0.00
j908 3.json	1	0	Optimal	0.02	70	70.00	0.00
j908 4.json	1	0	Optimal	0.02	77	77.00	0.00
j908 5.json	1	0	Optimal	0.03	63	63.00	0.00
j908 6.json	1	0	Optimal	0.02	70	70.00	0.00
j908 7.json	1	0	Optimal	0.02	77	77.00	0.00
j908 8.json	1	0	Optimal	0.02	68	68.00	0.00
j908 9.json	1	0	Optimal	0.02	97	97.00	0.00
j909 1.json	1	0	Solution	30.01	108	99.00	8.33
j909 10.json	1	0	Solution	30.01	115	104.00	9.57
j909 2.json	1	0	Solution	30.01	133	120.00	9.77
j909 3.json	1	0	Solution	30.01	106	98.00	7.55
j909 4.json	1	0	Solution	30.01	131	119.00	9.16
j909 5.json	1	0	Solution	30.00	143	123.00	13.99
j909 6.json	1	0	Solution	30.01	122	112.00	8.20
j909 7.json	1	0	Solution	30.01	110	103.00	6.36
j909 8.json	1	0	Solution	30.02	119	110.00	7.56
j909 9.json	1	0	Solution	30.01	119	106.00	10.92

9.3.2 CPSat

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9010 1.json	1	0	Optimal	0.06	77	77.00	0.00
j9010 10.json	1	0	Optimal	0.05	75	75.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9010 2.json	1	0	Optimal	0.08	95	95.00	0.00
j9010 3.json	1	0	Optimal	0.07	112	112.00	0.00
j9010 4.json	1	0	Optimal	0.05	94	94.00	0.00
j9010 5.json	1	0	Optimal	0.05	78	78.00	0.00
j9010 6.json	1	0	Optimal	0.03	92	92.00	0.00
j9010 7.json	1	0	Optimal	0.05	83	83.00	0.00
j9010 8.json	1	0	Optimal	0.09	81	81.00	0.00
j9010 9.json	1	0	Optimal	0.04	88	88.00	0.00
j9011 1.json	1	0	Optimal	0.06	86	86.00	0.00
j9011 10.json	1	0	Optimal	0.09	81	81.00	0.00
j9011 2.json	1	0	Optimal	0.07	99	99.00	0.00
j9011 3.json	1	0	Optimal	0.05	69	69.00	0.00
j9011 4.json	1	0	Optimal	0.05	64	64.00	0.00
j9011 5.json	1	0	Optimal	0.02	81	81.00	0.00
j9011 6.json	1	0	Optimal	0.04	78	78.00	0.00
j9011 7.json	1	0	Optimal	0.02	95	95.00	0.00
j9011 8.json	1	0	Optimal	0.04	82	82.00	0.00
j9011 9.json	1	0	Optimal	0.04	81	81.00	0.00
j9012 1.json	1	0	Optimal	0.02	71	71.00	0.00
j9012 10.json	1	0	Optimal	0.02	86	86.00	0.00
j9012 2.json	1	0	Optimal	0.02	71	71.00	0.00
j9012 3.json	1	0	Optimal	0.02	93	93.00	0.00
j9012 4.json	1	0	Optimal	0.02	73	73.00	0.00
j9012 5.json	1	0	Optimal	0.03	83	83.00	0.00
j9012 6.json	1	0	Optimal	0.02	81	81.00	0.00
j9012 7.json	1	0	Optimal	0.03	77	77.00	0.00
j9012 8.json	1	0	Optimal	0.02	83	83.00	0.00
j9012 9.json	1	0	Optimal	0.02	77	77.00	0.00
j9013 1.json	1	0	Solution	30.02	144	127.00	11.81
j9013 10.json	1	0	Solution	30.04	127	112.00	11.81
j9013 2.json	1	0	Solution	30.02	134	116.00	13.43
j9013 3.json	1	0	Solution	30.03	112	104.00	7.14
j9013 4.json	1	0	Solution	30.03	118	108.00	8.47
j9013 5.json	1	0	Solution	30.02	119	108.00	9.24
j9013 6.json	1	0	Solution	30.03	131	116.00	11.45
j9013 7.json	1	0	Solution	30.02	131	114.00	12.98
j9013 8.json	1	0	Solution	30.03	124	112.00	9.68
j9013 9.json	1	0	Solution	30.01	128	115.00	10.16
j9014 1.json	1	0	Optimal	0.07	89	89.00	0.00
j9014 10.json	1	0	Optimal	0.08	85	85.00	0.00
j9014 2.json	1	0	Optimal	0.04	79	79.00	0.00
j9014 3.json	1	0	Optimal	0.06	94	94.00	0.00
j9014 4.json	1	0	Optimal	0.07	88	88.00	0.00
j9014 5.json	1	0	Optimal	0.07	84	84.00	0.00
j9014 6.json	1	0	Optimal	30.01	76	76.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9014 7.json	1	0	Optimal	0.04	86	86.00	0.00
j9014 8.json	1	0	Optimal	0.05	80	80.00	0.00
j9014 9.json	1	0	Optimal	0.06	112	112.00	0.00
j9015 1.json	1	0	Optimal	0.04	76	76.00	0.00
j9015 10.json	1	0	Optimal	0.06	78	78.00	0.00
j9015 2.json	1	0	Optimal	0.04	71	71.00	0.00
j9015 3.json	1	0	Optimal	0.04	82	82.00	0.00
j9015 4.json	1	0	Optimal	0.04	92	92.00	0.00
j9015 5.json	1	0	Optimal	0.07	93	93.00	0.00
j9015 6.json	1	0	Optimal	0.02	61	61.00	0.00
j9015 7.json	1	0	Optimal	0.04	82	82.00	0.00
j9015 8.json	1	0	Optimal	0.04	82	82.00	0.00
j9015 9.json	1	0	Optimal	0.04	83	83.00	0.00
j9016 1.json	1	0	Optimal	0.04	85	85.00	0.00
j9016 10.json	1	0	Optimal	0.03	71	71.00	0.00
j9016 2.json	1	0	Optimal	0.04	71	71.00	0.00
j9016 3.json	1	0	Optimal	0.04	73	73.00	0.00
j9016 4.json	1	0	Optimal	0.03	69	69.00	0.00
j9016 5.json	1	0	Optimal	0.04	71	71.00	0.00
j9016 6.json	1	0	Optimal	0.03	74	74.00	0.00
j9016 7.json	1	0	Optimal	0.02	65	65.00	0.00
j9016 8.json	1	0	Optimal	0.04	71	71.00	0.00
j9016 9.json	1	0	Optimal	0.03	66	66.00	0.00
j9017 1.json	1	0	Optimal	0.13	92	92.00	0.00
j9017 10.json	1	0	Optimal	0.18	89	89.00	0.00
j9017 2.json	1	0	Optimal	0.31	100	100.00	0.00
j9017 3.json	1	0	Optimal	0.13	89	89.00	0.00
j9017 4.json	1	0	Optimal	0.11	94	94.00	0.00
j9017 5.json	1	0	Optimal	0.12	113	113.00	0.00
j9017 6.json	1	0	Optimal	0.12	94	94.00	0.00
j9017 7.json	1	0	Optimal	0.12	80	80.00	0.00
j9017 8.json	1	0	Optimal	0.12	113	113.00	0.00
j9017 9.json	1	0	Optimal	0.14	96	96.00	0.00
j9018 1.json	1	0	Optimal	0.06	101	101.00	0.00
j9018 10.json	1	0	Optimal	0.07	94	94.00	0.00
j9018 2.json	1	0	Optimal	0.04	94	94.00	0.00
j9018 3.json	1	0	Optimal	0.07	83	83.00	0.00
j9018 4.json	1	0	Optimal	0.06	98	98.00	0.00
j9018 5.json	1	0	Optimal	0.04	90	90.00	0.00
j9018 6.json	1	0	Optimal	0.09	83	83.00	0.00
j9018 7.json	1	0	Optimal	0.07	73	73.00	0.00
j9018 8.json	1	0	Optimal	0.05	92	92.00	0.00
j9018 9.json	1	0	Optimal	0.05	79	79.00	0.00
j9019 1.json	1	0	Optimal	0.04	98	98.00	0.00
j9019 10.json	1	0	Optimal	0.03	85	85.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9019 2.json	1	0	Optimal	0.03	83	83.00	0.00
j9019 3.json	1	0	Optimal	0.02	89	89.00	0.00
j9019 4.json	1	0	Optimal	0.02	77	77.00	0.00
j9019 5.json	1	0	Optimal	0.03	66	66.00	0.00
j9019 6.json	1	0	Optimal	0.04	136	136.00	0.00
j9019 7.json	1	0	Optimal	0.06	66	66.00	0.00
j9019 8.json	1	0	Optimal	0.03	91	91.00	0.00
j9019 9.json	1	0	Optimal	0.02	121	121.00	0.00
j901 1.json	1	0	Optimal	0.12	73	73.00	0.00
j901 10.json	1	0	Optimal	0.09	90	90.00	0.00
j901 2.json	1	0	Optimal	0.13	92	92.00	0.00
j901 3.json	1	0	Optimal	0.21	66	66.00	0.00
j901 4.json	1	0	Optimal	1.51	86	86.00	0.00
j901 5.json	1	0	Optimal	0.11	87	87.00	0.00
j901 6.json	1	0	Optimal	0.14	74	74.00	0.00
j901 7.json	1	0	Optimal	0.08	91	91.00	0.00
j901 8.json	1	0	Optimal	0.14	95	95.00	0.00
j901 9.json	1	0	Optimal	0.25	72	72.00	0.00
j9020 1.json	1	0	Optimal	0.02	85	85.00	0.00
j9020 10.json	1	0	Optimal	0.02	89	89.00	0.00
j9020 2.json	1	0	Optimal	0.02	76	76.00	0.00
j9020 3.json	1	0	Optimal	0.02	86	86.00	0.00
j9020 4.json	1	0	Optimal	0.02	86	86.00	0.00
j9020 5.json	1	0	Optimal	0.02	88	88.00	0.00
j9020 6.json	1	0	Optimal	0.02	83	83.00	0.00
j9020 7.json	1	0	Optimal	0.03	82	82.00	0.00
j9020 8.json	1	0	Optimal	0.02	85	85.00	0.00
j9020 9.json	1	0	Optimal	0.03	76	76.00	0.00
j9021 1.json	1	0	Solution	30.03	111	100.00	9.91
j9021 10.json	1	0	Solution	30.03	109	102.00	6.42
j9021 2.json	1	0	Solution	30.02	116	108.00	6.90
j9021 3.json	1	0	Solution	30.03	124	117.00	5.65
j9021 4.json	1	0	Optimal	30.01	106	106.00	0.00
j9021 5.json	1	0	Solution	30.03	112	101.00	9.82
j9021 6.json	1	0	Solution	30.03	106	103.00	2.83
j9021 7.json	1	0	Solution	30.06	110	101.00	8.18
j9021 8.json	1	0	Solution	30.05	112	101.00	9.82
j9021 9.json	1	0	Solution	30.04	121	113.00	6.61
j9022 1.json	1	0	Optimal	0.05	108	108.00	0.00
j9022 10.json	1	0	Optimal	0.12	75	75.00	0.00
j9022 2.json	1	0	Optimal	0.09	85	85.00	0.00
j9022 3.json	1	0	Optimal	0.12	83	83.00	0.00
j9022 4.json	1	0	Optimal	0.04	96	96.00	0.00
j9022 5.json	1	0	Optimal	0.05	96	96.00	0.00
j9022 6.json	1	0	Optimal	0.07	71	71.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9022 7.json	1	0	Optimal	0.07	90	90.00	0.00
j9022 8.json	1	0	Optimal	0.04	97	97.00	0.00
j9022 9.json	1	0	Optimal	0.15	101	101.00	0.00
j9023 1.json	1	0	Optimal	0.07	90	90.00	0.00
j9023 10.json	1	0	Optimal	0.04	87	87.00	0.00
j9023 2.json	1	0	Optimal	0.02	84	84.00	0.00
j9023 3.json	1	0	Optimal	0.04	116	116.00	0.00
j9023 4.json	1	0	Optimal	0.06	85	85.00	0.00
j9023 5.json	1	0	Optimal	0.02	95	95.00	0.00
j9023 6.json	1	0	Optimal	0.06	87	87.00	0.00
j9023 7.json	1	0	Optimal	0.04	77	77.00	0.00
j9023 8.json	1	0	Optimal	0.02	92	92.00	0.00
j9023 9.json	1	0	Optimal	0.04	126	126.00	0.00
j9024 1.json	1	0	Optimal	0.02	84	84.00	0.00
j9024 10.json	1	0	Optimal	0.04	89	89.00	0.00
j9024 2.json	1	0	Optimal	0.02	92	92.00	0.00
j9024 3.json	1	0	Optimal	0.02	69	69.00	0.00
j9024 4.json	1	0	Optimal	0.02	81	81.00	0.00
j9024 5.json	1	0	Optimal	0.02	85	85.00	0.00
j9024 6.json	1	0	Optimal	0.03	79	79.00	0.00
j9024 7.json	1	0	Optimal	0.02	87	87.00	0.00
j9024 8.json	1	0	Optimal	0.02	88	88.00	0.00
j9024 9.json	1	0	Optimal	0.03	80	80.00	0.00
j9025 1.json	1	0	Solution	30.02	128	115.00	10.16
j9025 10.json	1	0	Solution	30.07	132	118.00	10.61
j9025 2.json	1	0	Solution	30.03	135	120.00	11.11
j9025 3.json	1	0	Solution	30.03	125	111.00	11.20
j9025 4.json	1	0	Solution	30.04	143	128.00	10.49
j9025 5.json	1	0	Solution	30.04	120	109.00	9.17
j9025 6.json	1	0	Solution	30.02	126	112.00	11.11
j9025 7.json	1	0	Solution	30.07	136	121.00	11.03
j9025 8.json	1	0	Solution	30.03	142	130.00	8.45
j9025 9.json	1	0	Solution	30.02	109	96.00	11.93
j9026 1.json	1	0	Optimal	0.05	90	90.00	0.00
j9026 10.json	1	0	Optimal	0.08	92	92.00	0.00
j9026 2.json	1	0	Optimal	30.01	85	85.00	0.00
j9026 3.json	1	0	Optimal	0.07	80	80.00	0.00
j9026 4.json	1	0	Solution	30.03	97	96.00	1.03
j9026 5.json	1	0	Solution	30.03	86	83.00	3.49
j9026 6.json	1	0	Optimal	0.08	108	108.00	0.00
j9026 7.json	1	0	Optimal	0.80	82	82.00	0.00
j9026 8.json	1	0	Optimal	30.01	82	82.00	0.00
j9026 9.json	1	0	Optimal	0.09	87	87.00	0.00
j9027 1.json	1	0	Optimal	0.05	96	96.00	0.00
j9027 10.json	1	0	Optimal	0.05	97	97.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9027 2.json	1	0	Optimal	0.05	81	81.00	0.00
j9027 3.json	1	0	Optimal	0.04	91	91.00	0.00
j9027 4.json	1	0	Optimal	0.06	79	79.00	0.00
j9027 5.json	1	0	Optimal	0.04	99	99.00	0.00
j9027 6.json	1	0	Optimal	0.06	87	87.00	0.00
j9027 7.json	1	0	Optimal	0.04	73	73.00	0.00
j9027 8.json	1	0	Optimal	0.05	72	72.00	0.00
j9027 9.json	1	0	Optimal	0.05	84	84.00	0.00
j9028 1.json	1	0	Optimal	0.03	80	80.00	0.00
j9028 10.json	1	0	Optimal	0.03	68	68.00	0.00
j9028 2.json	1	0	Optimal	0.03	76	76.00	0.00
j9028 3.json	1	0	Optimal	0.03	86	86.00	0.00
j9028 4.json	1	0	Optimal	0.03	78	78.00	0.00
j9028 5.json	1	0	Optimal	0.03	88	88.00	0.00
j9028 6.json	1	0	Optimal	0.03	102	102.00	0.00
j9028 7.json	1	0	Optimal	0.03	97	97.00	0.00
j9028 8.json	1	0	Optimal	0.03	110	110.00	0.00
j9028 9.json	1	0	Optimal	0.03	120	120.00	0.00
j9029 1.json	1	0	Solution	30.02	139	123.00	11.51
j9029 10.json	1	0	Solution	30.02	129	117.00	9.30
j9029 2.json	1	0	Solution	30.03	130	120.00	7.69
j9029 3.json	1	0	Solution	30.05	148	135.00	8.78
j9029 4.json	1	0	Solution	30.04	156	136.00	12.82
j9029 5.json	1	0	Solution	30.03	127	114.00	10.24
j9029 6.json	1	0	Solution	30.03	131	116.00	11.45
j9029 7.json	1	0	Solution	30.03	177	158.00	10.73
j9029 8.json	1	0	Solution	30.03	162	145.00	10.49
j9029 9.json	1	0	Solution	30.03	134	118.00	11.94
j902 1.json	1	0	Optimal	0.05	96	96.00	0.00
j902 10.json	1	0	Optimal	0.09	80	80.00	0.00
j902 2.json	1	0	Optimal	0.07	114	114.00	0.00
j902 3.json	1	0	Optimal	0.05	75	75.00	0.00
j902 4.json	1	0	Optimal	0.03	70	70.00	0.00
j902 5.json	1	0	Optimal	0.02	100	100.00	0.00
j902 6.json	1	0	Optimal	0.11	67	67.00	0.00
j902 7.json	1	0	Optimal	0.06	92	92.00	0.00
j902 8.json	1	0	Optimal	0.04	82	82.00	0.00
j902 9.json	1	0	Optimal	0.06	79	79.00	0.00
j9030 1.json	1	0	Optimal	0.07	102	102.00	0.00
j9030 10.json	1	0	Optimal	0.09	90	90.00	0.00
j9030 2.json	1	0	Optimal	0.05	76	76.00	0.00
j9030 3.json	1	0	Optimal	0.09	102	102.00	0.00
j9030 4.json	1	0	Optimal	0.08	104	104.00	0.00
j9030 5.json	1	0	Solution	30.02	85	83.00	2.35
j9030 6.json	1	0	Optimal	0.06	90	90.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9030 7.json	1	0	Solution	30.03	85	84.00	1.18
j9030 8.json	1	0	Optimal	0.08	82	82.00	0.00
j9030 9.json	1	0	Solution	30.02	96	90.00	6.25
j9031 1.json	1	0	Optimal	0.05	79	79.00	0.00
j9031 10.json	1	0	Optimal	0.06	99	99.00	0.00
j9031 2.json	1	0	Optimal	0.04	69	69.00	0.00
j9031 3.json	1	0	Optimal	0.07	106	106.00	0.00
j9031 4.json	1	0	Optimal	0.05	79	79.00	0.00
j9031 5.json	1	0	Optimal	0.02	79	79.00	0.00
j9031 6.json	1	0	Optimal	0.05	80	80.00	0.00
j9031 7.json	1	0	Optimal	0.03	97	97.00	0.00
j9031 8.json	1	0	Optimal	0.04	83	83.00	0.00
j9031 9.json	1	0	Optimal	0.04	72	72.00	0.00
j9032 1.json	1	0	Optimal	0.04	78	78.00	0.00
j9032 10.json	1	0	Optimal	0.03	91	91.00	0.00
j9032 2.json	1	0	Optimal	0.04	78	78.00	0.00
j9032 3.json	1	0	Optimal	0.03	89	89.00	0.00
j9032 4.json	1	0	Optimal	0.04	104	104.00	0.00
j9032 5.json	1	0	Optimal	0.04	93	93.00	0.00
j9032 6.json	1	0	Optimal	0.04	86	86.00	0.00
j9032 7.json	1	0	Optimal	0.03	87	87.00	0.00
j9032 8.json	1	0	Optimal	0.04	79	79.00	0.00
j9032 9.json	1	0	Optimal	0.03	95	95.00	0.00
j9033 1.json	1	0	Optimal	0.16	99	99.00	0.00
j9033 10.json	1	0	Optimal	0.11	114	114.00	0.00
j9033 2.json	1	0	Optimal	0.12	112	112.00	0.00
j9033 3.json	1	0	Optimal	0.09	108	108.00	0.00
j9033 4.json	1	0	Optimal	0.12	92	92.00	0.00
j9033 5.json	1	0	Optimal	0.12	109	109.00	0.00
j9033 6.json	1	0	Optimal	0.12	88	88.00	0.00
j9033 7.json	1	0	Optimal	0.10	109	109.00	0.00
j9033 8.json	1	0	Optimal	0.13	110	110.00	0.00
j9033 9.json	1	0	Optimal	0.12	95	95.00	0.00
j9034 1.json	1	0	Optimal	0.07	83	83.00	0.00
j9034 10.json	1	0	Optimal	0.04	101	101.00	0.00
j9034 2.json	1	0	Optimal	0.04	89	89.00	0.00
j9034 3.json	1	0	Optimal	0.05	82	82.00	0.00
j9034 4.json	1	0	Optimal	0.05	81	81.00	0.00
j9034 5.json	1	0	Optimal	0.07	83	83.00	0.00
j9034 6.json	1	0	Optimal	0.05	89	89.00	0.00
j9034 7.json	1	0	Optimal	0.06	92	92.00	0.00
j9034 8.json	1	0	Optimal	0.07	81	81.00	0.00
j9034 9.json	1	0	Optimal	0.05	109	109.00	0.00
j9035 1.json	1	0	Optimal	0.03	98	98.00	0.00
j9035 10.json	1	0	Optimal	0.04	82	82.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9035 2.json	1	0	Optimal	0.04	92	92.00	0.00
j9035 3.json	1	0	Optimal	0.05	96	96.00	0.00
j9035 4.json	1	0	Optimal	0.04	86	86.00	0.00
j9035 5.json	1	0	Optimal	0.04	103	103.00	0.00
j9035 6.json	1	0	Optimal	0.07	72	72.00	0.00
j9035 7.json	1	0	Optimal	0.04	78	78.00	0.00
j9035 8.json	1	0	Optimal	0.04	85	85.00	0.00
j9035 9.json	1	0	Optimal	0.04	76	76.00	0.00
j9036 1.json	1	0	Optimal	0.03	97	97.00	0.00
j9036 10.json	1	0	Optimal	0.02	109	109.00	0.00
j9036 2.json	1	0	Optimal	0.03	114	114.00	0.00
j9036 3.json	1	0	Optimal	0.03	84	84.00	0.00
j9036 4.json	1	0	Optimal	0.02	79	79.00	0.00
j9036 5.json	1	0	Optimal	0.02	98	98.00	0.00
j9036 6.json	1	0	Optimal	0.04	99	99.00	0.00
j9036 7.json	1	0	Optimal	0.03	89	89.00	0.00
j9036 8.json	1	0	Optimal	0.03	84	84.00	0.00
j9036 9.json	1	0	Optimal	0.03	102	102.00	0.00
j9037 1.json	1	0	Optimal	30.01	110	110.00	0.00
j9037 10.json	1	0	Solution	30.05	124	112.00	9.68
j9037 2.json	1	0	Solution	30.05	116	105.00	9.48
j9037 3.json	1	0	Optimal	8.76	132	132.00	0.00
j9037 4.json	1	0	Optimal	30.01	123	123.00	0.00
j9037 5.json	1	0	Solution	30.04	126	114.00	9.52
j9037 6.json	1	0	Solution	30.03	132	120.00	9.09
j9037 7.json	1	0	Optimal	30.02	123	123.00	0.00
j9037 8.json	1	0	Solution	30.03	119	105.00	11.76
j9037 9.json	1	0	Optimal	30.02	123	123.00	0.00
j9038 1.json	1	0	Optimal	0.11	85	85.00	0.00
j9038 10.json	1	0	Optimal	0.09	108	108.00	0.00
j9038 2.json	1	0	Optimal	0.10	78	78.00	0.00
j9038 3.json	1	0	Optimal	0.42	89	89.00	0.00
j9038 4.json	1	0	Optimal	0.10	89	89.00	0.00
j9038 5.json	1	0	Optimal	0.40	86	86.00	0.00
j9038 6.json	1	0	Optimal	0.09	88	88.00	0.00
j9038 7.json	1	0	Optimal	0.09	85	85.00	0.00
j9038 8.json	1	0	Optimal	0.09	91	91.00	0.00
j9038 9.json	1	0	Optimal	0.17	95	95.00	0.00
j9039 1.json	1	0	Optimal	0.08	106	106.00	0.00
j9039 10.json	1	0	Optimal	0.04	100	100.00	0.00
j9039 2.json	1	0	Optimal	0.03	119	119.00	0.00
j9039 3.json	1	0	Optimal	0.04	83	83.00	0.00
j9039 4.json	1	0	Optimal	0.04	81	81.00	0.00
j9039 5.json	1	0	Optimal	0.04	85	85.00	0.00
j9039 6.json	1	0	Optimal	0.08	102	102.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9039 7.json	1	0	Optimal	0.04	85	85.00	0.00
j9039 8.json	1	0	Optimal	0.05	81	81.00	0.00
j9039 9.json	1	0	Optimal	0.09	79	79.00	0.00
j903 1.json	1	0	Optimal	0.04	81	81.00	0.00
j903 10.json	1	0	Optimal	0.04	65	65.00	0.00
j903 2.json	1	0	Optimal	0.03	84	84.00	0.00
j903 3.json	1	0	Optimal	0.04	71	71.00	0.00
j903 4.json	1	0	Optimal	0.04	104	104.00	0.00
j903 5.json	1	0	Optimal	0.03	75	75.00	0.00
j903 6.json	1	0	Optimal	0.04	68	68.00	0.00
j903 7.json	1	0	Optimal	0.03	87	87.00	0.00
j903 8.json	1	0	Optimal	0.04	86	86.00	0.00
j903 9.json	1	0	Optimal	0.06	61	61.00	0.00
j9040 1.json	1	0	Optimal	0.02	95	95.00	0.00
j9040 10.json	1	0	Optimal	0.04	86	86.00	0.00
j9040 2.json	1	0	Optimal	0.02	91	91.00	0.00
j9040 3.json	1	0	Optimal	0.02	77	77.00	0.00
j9040 4.json	1	0	Optimal	0.04	106	106.00	0.00
j9040 5.json	1	0	Optimal	0.03	92	92.00	0.00
j9040 6.json	1	0	Optimal	0.04	86	86.00	0.00
j9040 7.json	1	0	Optimal	0.02	87	87.00	0.00
j9040 8.json	1	0	Optimal	0.02	79	79.00	0.00
j9040 9.json	1	0	Optimal	0.02	98	98.00	0.00
j9041 1.json	1	0	Solution	30.02	147	128.00	12.93
j9041 10.json	1	0	Solution	30.02	153	143.00	6.54
j9041 2.json	1	0	Solution	30.03	173	152.00	12.14
j9041 3.json	1	0	Solution	30.02	171	145.00	15.20
j9041 4.json	1	0	Solution	30.02	161	140.00	13.04
j9041 5.json	1	0	Solution	30.02	131	114.00	12.98
j9041 6.json	1	0	Solution	30.03	137	119.00	13.14
j9041 7.json	1	0	Solution	30.03	162	140.00	13.58
j9041 8.json	1	0	Solution	30.07	170	144.00	15.29
j9041 9.json	1	0	Solution	30.03	123	109.00	11.38
j9042 1.json	1	0	Optimal	0.15	106	106.00	0.00
j9042 10.json	1	0	Solution	30.03	91	88.00	3.30
j9042 2.json	1	0	Optimal	30.01	102	102.00	0.00
j9042 3.json	1	0	Optimal	0.08	94	94.00	0.00
j9042 4.json	1	0	Optimal	0.07	102	102.00	0.00
j9042 5.json	1	0	Optimal	0.09	105	105.00	0.00
j9042 6.json	1	0	Optimal	0.07	89	89.00	0.00
j9042 7.json	1	0	Solution	30.04	87	85.00	2.30
j9042 8.json	1	0	Optimal	0.09	105	105.00	0.00
j9042 9.json	1	0	Optimal	10.18	83	83.00	0.00
j9043 1.json	1	0	Optimal	0.07	99	99.00	0.00
j9043 10.json	1	0	Optimal	0.07	92	92.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9043 2.json	1	0	Optimal	0.02	91	91.00	0.00
j9043 3.json	1	0	Optimal	0.06	102	102.00	0.00
j9043 4.json	1	0	Optimal	0.02	94	94.00	0.00
j9043 5.json	1	0	Optimal	0.04	98	98.00	0.00
j9043 6.json	1	0	Optimal	0.04	114	114.00	0.00
j9043 7.json	1	0	Optimal	0.07	88	88.00	0.00
j9043 8.json	1	0	Optimal	0.05	100	100.00	0.00
j9043 9.json	1	0	Optimal	0.02	88	88.00	0.00
j9044 1.json	1	0	Optimal	0.02	100	100.00	0.00
j9044 10.json	1	0	Optimal	0.03	86	86.00	0.00
j9044 2.json	1	0	Optimal	0.02	92	92.00	0.00
j9044 3.json	1	0	Optimal	0.02	110	110.00	0.00
j9044 4.json	1	0	Optimal	0.04	89	89.00	0.00
j9044 5.json	1	0	Optimal	0.03	84	84.00	0.00
j9044 6.json	1	0	Optimal	0.02	96	96.00	0.00
j9044 7.json	1	0	Optimal	0.02	93	93.00	0.00
j9044 8.json	1	0	Optimal	0.02	99	99.00	0.00
j9044 9.json	1	0	Optimal	0.02	96	96.00	0.00
j9045 1.json	1	0	Solution	30.03	152	142.00	6.58
j9045 10.json	1	0	Solution	30.02	177	155.00	12.43
j9045 2.json	1	0	Solution	30.03	153	136.00	11.11
j9045 3.json	1	0	Solution	30.09	161	139.00	13.66
j9045 4.json	1	0	Solution	30.03	140	123.00	12.14
j9045 5.json	1	0	Solution	30.03	186	162.00	12.90
j9045 6.json	1	0	Solution	30.03	186	160.00	13.98
j9045 7.json	1	0	Solution	30.03	146	127.00	13.01
j9045 8.json	1	0	Solution	30.03	167	147.00	11.98
j9045 9.json	1	0	Solution	30.03	163	141.00	13.50
j9046 1.json	1	0	Optimal	30.01	104	104.00	0.00
j9046 10.json	1	0	Optimal	0.09	114	114.00	0.00
j9046 2.json	1	0	Optimal	0.12	98	98.00	0.00
j9046 3.json	1	0	Optimal	0.16	113	113.00	0.00
j9046 4.json	1	0	Solution	30.01	94	90.00	4.26
j9046 5.json	1	0	Optimal	0.08	91	91.00	0.00
j9046 6.json	1	0	Optimal	0.09	83	83.00	0.00
j9046 7.json	1	0	Optimal	0.21	89	89.00	0.00
j9046 8.json	1	0	Solution	30.03	98	93.00	5.10
j9046 9.json	1	0	Solution	30.02	90	85.00	5.56
j9047 1.json	1	0	Optimal	0.05	82	82.00	0.00
j9047 10.json	1	0	Optimal	0.05	65	65.00	0.00
j9047 2.json	1	0	Optimal	0.05	90	90.00	0.00
j9047 3.json	1	0	Optimal	0.07	102	102.00	0.00
j9047 4.json	1	0	Optimal	0.07	93	93.00	0.00
j9047 5.json	1	0	Optimal	0.03	93	93.00	0.00
j9047 6.json	1	0	Optimal	0.04	98	98.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j9047 7.json	1	0	Optimal	0.04	94	94.00	0.00
j9047 8.json	1	0	Optimal	0.04	98	98.00	0.00
j9047 9.json	1	0	Optimal	0.04	86	86.00	0.00
j9048 1.json	1	0	Optimal	0.03	83	83.00	0.00
j9048 10.json	1	0	Optimal	0.04	93	93.00	0.00
j9048 2.json	1	0	Optimal	0.04	89	89.00	0.00
j9048 3.json	1	0	Optimal	0.04	86	86.00	0.00
j9048 4.json	1	0	Optimal	0.04	91	91.00	0.00
j9048 5.json	1	0	Optimal	0.04	75	75.00	0.00
j9048 6.json	1	0	Optimal	0.03	114	114.00	0.00
j9048 7.json	1	0	Optimal	0.03	103	103.00	0.00
j9048 8.json	1	0	Optimal	0.04	74	74.00	0.00
j9048 9.json	1	0	Optimal	0.04	89	89.00	0.00
j904 1.json	1	0	Optimal	0.02	93	93.00	0.00
j904 10.json	1	0	Optimal	0.02	68	68.00	0.00
j904 2.json	1	0	Optimal	0.02	89	89.00	0.00
j904 3.json	1	0	Optimal	0.02	67	67.00	0.00
j904 4.json	1	0	Optimal	0.02	92	92.00	0.00
j904 5.json	1	0	Optimal	0.02	88	88.00	0.00
j904 6.json	1	0	Optimal	0.02	78	78.00	0.00
j904 7.json	1	0	Optimal	0.03	80	80.00	0.00
j904 8.json	1	0	Optimal	0.03	69	69.00	0.00
j904 9.json	1	0	Optimal	0.02	79	79.00	0.00
j905 1.json	1	0	Optimal	30.01	78	78.00	0.00
j905 10.json	1	0	Solution	30.04	98	94.00	4.08
j905 2.json	1	0	Optimal	30.00	93	93.00	0.00
j905 3.json	1	0	Solution	30.04	91	83.00	8.79
j905 4.json	1	0	Solution	30.02	103	98.00	4.85
j905 5.json	1	0	Solution	30.02	113	108.00	4.42
j905 6.json	1	0	Solution	30.03	87	83.00	4.60
j905 7.json	1	0	Solution	30.03	109	106.00	2.75
j905 8.json	1	0	Solution	30.02	105	96.00	8.57
j905 9.json	1	0	Solution	30.02	116	107.00	7.76
j906 1.json	1	0	Optimal	0.06	82	82.00	0.00
j906 10.json	1	0	Optimal	0.09	94	94.00	0.00
j906 2.json	1	0	Optimal	0.06	86	86.00	0.00
j906 3.json	1	0	Optimal	0.18	77	77.00	0.00
j906 4.json	1	0	Optimal	0.05	80	80.00	0.00
j906 5.json	1	0	Optimal	0.08	71	71.00	0.00
j906 6.json	1	0	Optimal	0.04	98	98.00	0.00
j906 7.json	1	0	Optimal	0.04	71	71.00	0.00
j906 8.json	1	0	Optimal	18.15	68	68.00	0.00
j906 9.json	1	0	Optimal	0.04	68	68.00	0.00
j907 1.json	1	0	Optimal	0.03	88	88.00	0.00
j907 10.json	1	0	Optimal	0.02	98	98.00	0.00

Table 9.6: Results for RCPSP J90 (CPSat) (480 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j907 2.json	1	0	Optimal	0.02	77	77.00	0.00
j907 3.json	1	0	Optimal	0.03	80	80.00	0.00
j907 4.json	1	0	Optimal	0.03	86	86.00	0.00
j907 5.json	1	0	Optimal	0.04	79	79.00	0.00
j907 6.json	1	0	Optimal	0.04	90	90.00	0.00
j907 7.json	1	0	Optimal	0.02	90	90.00	0.00
j907 8.json	1	0	Optimal	0.02	60	60.00	0.00
j907 9.json	1	0	Optimal	0.06	83	83.00	0.00
j908 1.json	1	0	Optimal	0.02	96	96.00	0.00
j908 10.json	1	0	Optimal	0.02	88	88.00	0.00
j908 2.json	1	0	Optimal	0.02	78	78.00	0.00
j908 3.json	1	0	Optimal	0.02	70	70.00	0.00
j908 4.json	1	0	Optimal	0.02	77	77.00	0.00
j908 5.json	1	0	Optimal	0.03	63	63.00	0.00
j908 6.json	1	0	Optimal	0.02	70	70.00	0.00
j908 7.json	1	0	Optimal	0.02	77	77.00	0.00
j908 8.json	1	0	Optimal	0.02	68	68.00	0.00
j908 9.json	1	0	Optimal	0.02	97	97.00	0.00
j909 1.json	1	0	Solution	30.02	108	98.00	9.26
j909 10.json	1	0	Solution	30.02	115	104.00	9.57
j909 2.json	1	0	Solution	30.04	132	120.00	9.09
j909 3.json	1	0	Solution	30.02	106	97.00	8.49
j909 4.json	1	0	Solution	30.02	132	118.00	10.61
j909 5.json	1	0	Solution	30.06	145	125.00	13.79
j909 6.json	1	0	Solution	30.03	121	111.00	8.26
j909 7.json	1	0	Solution	30.02	113	102.00	9.73
j909 8.json	1	0	Solution	30.07	121	109.00	9.92
j909 9.json	1	0	Solution	30.04	122	105.00	13.93

9.4 Size J120

9.4.1 CPO

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12010 1.json	1	0	Optimal	0.12	111	111.00	0.00
j12010 10.json	1	0	Optimal	0.03	66	66.00	0.00
j12010 2.json	1	0	Optimal	0.04	91	91.00	0.00
j12010 3.json	1	0	Optimal	0.05	99	99.00	0.00
j12010 4.json	1	0	Optimal	0.03	95	95.00	0.00
j12010 5.json	1	0	Optimal	0.03	97	97.00	0.00

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12010 6.json	1	0	Optimal	0.03	92	92.00	0.00
j12010 7.json	1	0	Optimal	0.06	79	79.00	0.00
j12010 8.json	1	0	Optimal	0.03	114	114.00	0.00
j12010 9.json	1	0	Optimal	0.02	77	77.00	0.00
j12011 1.json	1	0	Solution	60.02	180	155.00	13.89
j12011 10.json	1	0	Solution	60.03	188	163.00	13.30
j12011 2.json	1	0	Solution	60.02	164	144.00	12.20
j12011 3.json	1	0	Solution	60.03	212	186.00	12.26
j12011 4.json	1	0	Solution	60.03	207	175.00	15.46
j12011 5.json	1	0	Solution	60.03	222	191.00	13.96
j12011 6.json	1	0	Solution	60.02	223	188.00	15.70
j12011 7.json	1	0	Solution	60.03	170	147.00	13.53
j12011 8.json	1	0	Solution	60.02	167	151.00	9.58
j12011 9.json	1	0	Solution	60.05	181	167.00	7.73
j12012 1.json	1	0	Solution	60.02	143	127.00	11.19
j12012 10.json	1	0	Solution	60.02	146	142.00	2.74
j12012 2.json	1	0	Solution	60.01	119	111.00	6.72
j12012 3.json	1	0	Solution	60.02	140	132.00	5.71
j12012 4.json	1	0	Solution	60.02	128	122.00	4.69
j12012 5.json	1	0	Solution	60.01	168	153.00	8.93
j12012 6.json	1	0	Solution	60.02	126	116.00	7.94
j12012 7.json	1	0	Solution	60.03	123	116.00	5.69
j12012 8.json	1	0	Solution	60.02	123	113.00	8.13
j12012 9.json	1	0	Solution	60.02	109	101.00	7.34
j12013 1.json	1	0	Solution	60.03	130	123.00	5.38
j12013 10.json	1	0	Solution	60.02	95	89.00	6.32
j12013 2.json	1	0	Solution	60.02	89	88.00	1.12
j12013 3.json	1	0	Solution	60.02	121	115.00	4.96
j12013 4.json	1	0	Solution	60.01	115	108.00	6.09
j12013 5.json	1	0	Solution	60.02	93	90.00	3.23
j12013 6.json	1	0	Solution	60.03	101	95.00	5.94
j12013 7.json	1	0	Solution	60.01	112	107.00	4.46
j12013 8.json	1	0	Solution	60.01	97	91.00	6.19
j12013 9.json	1	0	Solution	60.01	86	83.00	3.49
j12014 1.json	1	0	Solution	60.02	87	84.00	3.45
j12014 10.json	1	0	Solution	60.02	83	80.00	3.61
j12014 2.json	1	0	Solution	60.02	94	90.00	4.26
j12014 3.json	1	0	Optimal	1.53	88	88.00	0.00
j12014 4.json	1	0	Solution	60.02	90	85.00	5.56
j12014 5.json	1	0	Solution	60.01	99	93.00	6.06
j12014 6.json	1	0	Optimal	0.62	91	91.00	0.00
j12014 7.json	1	0	Solution	60.03	91	90.00	1.10
j12014 8.json	1	0	Solution	60.02	114	110.00	3.51
j12014 9.json	1	0	Optimal	0.05	101	101.00	0.00
j12015 1.json	1	0	Optimal	0.02	81	81.00	0.00

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12015 10.json	1	0	Optimal	0.03	91	91.00	0.00
j12015 2.json	1	0	Optimal	0.03	75	75.00	0.00
j12015 3.json	1	0	Optimal	0.04	87	87.00	0.00
j12015 4.json	1	0	Optimal	0.02	82	82.00	0.00
j12015 5.json	1	0	Optimal	0.03	87	87.00	0.00
j12015 6.json	1	0	Optimal	0.03	97	97.00	0.00
j12015 7.json	1	0	Optimal	0.03	75	75.00	0.00
j12015 8.json	1	0	Optimal	0.02	126	126.00	0.00
j12015 9.json	1	0	Optimal	0.04	109	109.00	0.00
j12016 1.json	1	0	Solution	60.03	204	179.00	12.25
j12016 10.json	1	0	Solution	60.01	224	201.00	10.27
j12016 2.json	1	0	Solution	60.02	243	221.00	9.05
j12016 3.json	1	0	Solution	60.02	245	219.00	10.61
j12016 4.json	1	0	Solution	60.01	207	189.00	8.70
j12016 5.json	1	0	Solution	60.01	207	182.00	12.08
j12016 6.json	1	0	Solution	60.03	213	194.00	8.92
j12016 7.json	1	0	Solution	60.02	191	174.00	8.90
j12016 8.json	1	0	Solution	60.02	200	180.00	10.00
j12016 9.json	1	0	Solution	60.02	214	188.00	12.15
j12017 1.json	1	0	Solution	60.01	145	135.00	6.90
j12017 10.json	1	0	Solution	60.02	139	131.00	5.76
j12017 2.json	1	0	Solution	60.02	128	121.00	5.47
j12017 3.json	1	0	Solution	60.02	111	106.00	4.50
j12017 4.json	1	0	Solution	60.02	123	118.00	4.07
j12017 5.json	1	0	Solution	60.01	133	123.00	7.52
j12017 6.json	1	0	Solution	60.02	140	133.00	5.00
j12017 7.json	1	0	Solution	60.00	150	141.00	6.00
j12017 8.json	1	0	Solution	60.02	131	126.00	3.82
j12017 9.json	1	0	Solution	60.01	138	129.00	6.52
j12018 1.json	1	0	Solution	60.01	142	137.00	3.52
j12018 10.json	1	0	Solution	60.01	100	97.00	3.00
j12018 2.json	1	0	Solution	60.00	119	111.00	6.72
j12018 3.json	1	0	Solution	60.01	103	100.00	2.91
j12018 4.json	1	0	Solution	60.01	103	98.00	4.85
j12018 5.json	1	0	Solution	60.01	121	117.00	3.31
j12018 6.json	1	0	Solution	60.01	137	131.00	4.38
j12018 7.json	1	0	Solution	60.02	120	112.00	6.67
j12018 8.json	1	0	Solution	60.00	107	102.00	4.67
j12018 9.json	1	0	Solution	60.02	94	89.00	5.32
j12019 1.json	1	0	Optimal	0.08	88	88.00	0.00
j12019 10.json	1	0	Optimal	0.03	88	88.00	0.00
j12019 2.json	1	0	Solution	60.02	84	81.00	3.57
j12019 3.json	1	0	Solution	60.02	86	83.00	3.49
j12019 4.json	1	0	Solution	60.02	110	103.00	6.36
j12019 5.json	1	0	Solution	60.02	106	101.00	4.72

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12019 6.json	1	0	Solution	60.00	91	89.00	2.20
j12019 7.json	1	0	Optimal	0.05	93	93.00	0.00
j12019 8.json	1	0	Solution	60.01	94	93.00	1.06
j12019 9.json	1	0	Solution	60.02	90	88.00	2.22
j1201 1.json	1	0	Optimal	22.53	105	105.00	0.00
j1201 10.json	1	0	Optimal	2.36	108	108.00	0.00
j1201 2.json	1	0	Optimal	2.20	109	109.00	0.00
j1201 3.json	1	0	Solution	60.02	126	115.00	8.73
j1201 4.json	1	0	Optimal	1.90	97	97.00	0.00
j1201 5.json	1	0	Optimal	3.17	112	112.00	0.00
j1201 6.json	1	0	Optimal	0.86	84	84.00	0.00
j1201 7.json	1	0	Optimal	0.97	117	117.00	0.00
j1201 8.json	1	0	Optimal	5.19	109	109.00	0.00
j1201 9.json	1	0	Optimal	0.86	112	112.00	0.00
j12020 1.json	1	0	Optimal	0.17	89	89.00	0.00
j12020 10.json	1	0	Optimal	0.03	81	81.00	0.00
j12020 2.json	1	0	Optimal	0.03	99	99.00	0.00
j12020 3.json	1	0	Solution	60.00	79	75.00	5.06
j12020 4.json	1	0	Optimal	0.02	89	89.00	0.00
j12020 5.json	1	0	Optimal	0.02	69	69.00	0.00
j12020 6.json	1	0	Optimal	0.02	80	80.00	0.00
j12020 7.json	1	0	Optimal	0.02	81	81.00	0.00
j12020 8.json	1	0	Optimal	10.16	107	107.00	0.00
j12020 9.json	1	0	Optimal	0.03	80	80.00	0.00
j12021 1.json	1	0	Optimal	8.08	114	114.00	0.00
j12021 10.json	1	0	Optimal	4.05	102	102.00	0.00
j12021 2.json	1	0	Optimal	15.64	117	117.00	0.00
j12021 3.json	1	0	Optimal	2.07	143	143.00	0.00
j12021 4.json	1	0	Optimal	6.50	135	135.00	0.00
j12021 5.json	1	0	Optimal	1.65	110	110.00	0.00
j12021 6.json	1	0	Optimal	2.84	109	109.00	0.00
j12021 7.json	1	0	Optimal	15.91	111	111.00	0.00
j12021 8.json	1	0	Optimal	0.56	127	127.00	0.00
j12021 9.json	1	0	Optimal	0.80	102	102.00	0.00
j12022 1.json	1	0	Optimal	0.91	101	101.00	0.00
j12022 10.json	1	0	Optimal	0.33	79	79.00	0.00
j12022 2.json	1	0	Optimal	0.03	107	107.00	0.00
j12022 3.json	1	0	Optimal	19.99	96	96.00	0.00
j12022 4.json	1	0	Optimal	0.50	90	90.00	0.00
j12022 5.json	1	0	Optimal	0.39	93	93.00	0.00
j12022 6.json	1	0	Optimal	0.53	103	103.00	0.00
j12022 7.json	1	0	Optimal	0.03	133	133.00	0.00
j12022 8.json	1	0	Optimal	3.32	103	103.00	0.00
j12022 9.json	1	0	Optimal	0.61	109	109.00	0.00
j12023 1.json	1	0	Optimal	0.03	107	107.00	0.00

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12023 10.json	1	0	Optimal	0.02	100	100.00	0.00
j12023 2.json	1	0	Optimal	0.02	116	116.00	0.00
j12023 3.json	1	0	Optimal	0.02	99	99.00	0.00
j12023 4.json	1	0	Optimal	0.02	106	106.00	0.00
j12023 5.json	1	0	Optimal	0.06	99	99.00	0.00
j12023 6.json	1	0	Optimal	0.03	106	106.00	0.00
j12023 7.json	1	0	Optimal	0.02	104	104.00	0.00
j12023 8.json	1	0	Optimal	0.02	101	101.00	0.00
j12023 9.json	1	0	Optimal	0.03	107	107.00	0.00
j12024 1.json	1	0	Optimal	0.02	93	93.00	0.00
j12024 10.json	1	0	Optimal	0.02	91	91.00	0.00
j12024 2.json	1	0	Optimal	0.05	91	91.00	0.00
j12024 3.json	1	0	Optimal	0.03	89	89.00	0.00
j12024 4.json	1	0	Optimal	0.03	101	101.00	0.00
j12024 5.json	1	0	Optimal	0.03	86	86.00	0.00
j12024 6.json	1	0	Optimal	0.02	95	95.00	0.00
j12024 7.json	1	0	Optimal	0.03	112	112.00	0.00
j12024 8.json	1	0	Optimal	0.02	104	104.00	0.00
j12024 9.json	1	0	Optimal	0.38	82	82.00	0.00
j12025 1.json	1	0	Optimal	0.02	82	82.00	0.00
j12025 10.json	1	0	Optimal	0.02	92	92.00	0.00
j12025 2.json	1	0	Optimal	0.02	108	108.00	0.00
j12025 3.json	1	0	Optimal	0.02	100	100.00	0.00
j12025 4.json	1	0	Optimal	0.02	117	117.00	0.00
j12025 5.json	1	0	Optimal	0.02	100	100.00	0.00
j12025 6.json	1	0	Optimal	0.03	92	92.00	0.00
j12025 7.json	1	0	Optimal	0.08	92	92.00	0.00
j12025 8.json	1	0	Optimal	0.02	80	80.00	0.00
j12025 9.json	1	0	Optimal	0.02	94	94.00	0.00
j12026 1.json	1	0	Solution	60.02	177	148.00	16.38
j12026 10.json	1	0	Solution	60.01	191	157.00	17.80
j12026 2.json	1	0	Solution	60.01	176	147.00	16.48
j12026 3.json	1	0	Solution	60.00	173	154.00	10.98
j12026 4.json	1	0	Solution	60.02	176	152.00	13.64
j12026 5.json	1	0	Solution	60.01	164	138.00	15.85
j12026 6.json	1	0	Solution	60.00	191	170.00	10.99
j12026 7.json	1	0	Solution	60.02	163	143.00	12.27
j12026 8.json	1	0	Solution	60.01	178	155.00	12.92
j12026 9.json	1	0	Solution	60.01	181	157.00	13.26
j12027 1.json	1	0	Solution	60.02	111	107.00	3.60
j12027 10.json	1	0	Solution	60.01	118	109.00	7.63
j12027 2.json	1	0	Solution	60.01	119	107.00	10.08
j12027 3.json	1	0	Solution	60.01	146	140.00	4.11
j12027 4.json	1	0	Solution	60.02	108	105.00	2.78
j12027 5.json	1	0	Solution	60.02	114	103.00	9.65

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12027 6.json	1	0	Solution	60.00	149	131.00	12.08
j12027 7.json	1	0	Solution	60.01	127	118.00	7.09
j12027 8.json	1	0	Solution	60.00	142	135.00	4.93
j12027 9.json	1	0	Solution	60.02	131	120.00	8.40
j12028 1.json	1	0	Solution	60.02	108	105.00	2.78
j12028 10.json	1	0	Solution	60.00	117	114.00	2.56
j12028 2.json	1	0	Optimal	5.74	110	110.00	0.00
j12028 3.json	1	0	Optimal	0.02	101	101.00	0.00
j12028 4.json	1	0	Optimal	25.01	112	112.00	0.00
j12028 5.json	1	0	Optimal	0.02	102	102.00	0.00
j12028 6.json	1	0	Optimal	1.77	103	103.00	0.00
j12028 7.json	1	0	Solution	60.00	111	107.00	3.60
j12028 8.json	1	0	Solution	60.00	100	98.00	2.00
j12028 9.json	1	0	Solution	60.02	98	97.00	1.02
j12029 1.json	1	0	Optimal	0.03	104	104.00	0.00
j12029 10.json	1	0	Optimal	0.03	96	96.00	0.00
j12029 2.json	1	0	Optimal	0.03	91	91.00	0.00
j12029 3.json	1	0	Solution	60.02	99	95.00	4.04
j12029 4.json	1	0	Optimal	3.90	80	80.00	0.00
j12029 5.json	1	0	Optimal	0.30	102	102.00	0.00
j12029 6.json	1	0	Solution	60.01	91	88.00	3.30
j12029 7.json	1	0	Optimal	0.02	97	97.00	0.00
j12029 8.json	1	0	Optimal	1.56	80	80.00	0.00
j12029 9.json	1	0	Optimal	0.03	97	97.00	0.00
j1202 1.json	1	0	Optimal	0.85	87	87.00	0.00
j1202 10.json	1	0	Optimal	0.55	96	96.00	0.00
j1202 2.json	1	0	Optimal	1.13	75	75.00	0.00
j1202 3.json	1	0	Optimal	1.63	92	92.00	0.00
j1202 4.json	1	0	Optimal	0.47	95	95.00	0.00
j1202 5.json	1	0	Optimal	0.60	103	103.00	0.00
j1202 6.json	1	0	Optimal	0.37	92	92.00	0.00
j1202 7.json	1	0	Optimal	0.20	90	90.00	0.00
j1202 8.json	1	0	Optimal	0.41	83	83.00	0.00
j1202 9.json	1	0	Optimal	1.27	94	94.00	0.00
j12030 1.json	1	0	Optimal	0.03	102	102.00	0.00
j12030 10.json	1	0	Optimal	0.03	86	86.00	0.00
j12030 2.json	1	0	Optimal	0.03	112	112.00	0.00
j12030 3.json	1	0	Optimal	0.02	108	108.00	0.00
j12030 4.json	1	0	Optimal	0.03	83	83.00	0.00
j12030 5.json	1	0	Optimal	2.12	83	83.00	0.00
j12030 6.json	1	0	Optimal	0.03	79	79.00	0.00
j12030 7.json	1	0	Optimal	0.63	93	93.00	0.00
j12030 8.json	1	0	Optimal	0.02	79	79.00	0.00
j12030 9.json	1	0	Optimal	0.02	93	93.00	0.00
j12031 1.json	1	0	Solution	60.02	206	178.00	13.59

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12031 10.json	1	0	Solution	60.03	234	201.00	14.10
j12031 2.json	1	0	Solution	60.02	200	174.00	13.00
j12031 3.json	1	0	Solution	60.02	181	158.00	12.71
j12031 4.json	1	0	Solution	60.01	234	188.00	19.66
j12031 5.json	1	0	Solution	60.02	211	184.00	12.80
j12031 6.json	1	0	Solution	60.02	201	182.00	9.45
j12031 7.json	1	0	Solution	60.02	214	189.00	11.68
j12031 8.json	1	0	Solution	60.00	199	172.00	13.57
j12031 9.json	1	0	Solution	60.02	198	173.00	12.63
j12032 1.json	1	0	Solution	60.01	150	141.00	6.00
j12032 10.json	1	0	Solution	60.02	133	125.00	6.02
j12032 2.json	1	0	Solution	60.01	135	123.00	8.89
j12032 3.json	1	0	Solution	60.01	150	134.00	10.67
j12032 4.json	1	0	Solution	60.02	139	127.00	8.63
j12032 5.json	1	0	Solution	60.00	142	133.00	6.34
j12032 6.json	1	0	Solution	60.01	132	122.00	7.58
j12032 7.json	1	0	Solution	60.01	125	118.00	5.60
j12032 8.json	1	0	Solution	60.01	139	132.00	5.04
j12032 9.json	1	0	Solution	60.00	130	125.00	3.85
j12033 1.json	1	0	Solution	60.00	109	105.00	3.67
j12033 10.json	1	0	Solution	60.02	109	102.00	6.42
j12033 2.json	1	0	Solution	60.02	116	107.00	7.76
j12033 3.json	1	0	Solution	60.03	110	102.00	7.27
j12033 4.json	1	0	Solution	60.02	114	106.00	7.02
j12033 5.json	1	0	Solution	60.02	144	133.00	7.64
j12033 6.json	1	0	Solution	60.01	117	115.00	1.71
j12033 7.json	1	0	Solution	60.01	125	121.00	3.20
j12033 8.json	1	0	Solution	60.02	114	107.00	6.14
j12033 9.json	1	0	Solution	60.01	117	109.00	6.84
j12034 1.json	1	0	Solution	60.02	79	76.00	3.80
j12034 10.json	1	0	Optimal	0.05	101	101.00	0.00
j12034 2.json	1	0	Solution	60.00	107	103.00	3.74
j12034 3.json	1	0	Solution	60.01	103	100.00	2.91
j12034 4.json	1	0	Optimal	3.83	95	95.00	0.00
j12034 5.json	1	0	Solution	60.01	104	101.00	2.88
j12034 6.json	1	0	Optimal	0.05	100	100.00	0.00
j12034 7.json	1	0	Optimal	2.62	105	105.00	0.00
j12034 8.json	1	0	Solution	60.01	91	86.00	5.49
j12034 9.json	1	0	Solution	60.01	96	91.00	5.21
j12035 1.json	1	0	Optimal	0.03	87	87.00	0.00
j12035 10.json	1	0	Optimal	0.03	86	86.00	0.00
j12035 2.json	1	0	Solution	60.02	112	111.00	0.89
j12035 3.json	1	0	Optimal	1.08	77	77.00	0.00
j12035 4.json	1	0	Optimal	0.05	101	101.00	0.00
j12035 5.json	1	0	Solution	60.00	93	92.00	1.08

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12035 6.json	1	0	Optimal	0.02	86	86.00	0.00
j12035 7.json	1	0	Optimal	0.02	99	99.00	0.00
j12035 8.json	1	0	Optimal	0.03	101	101.00	0.00
j12035 9.json	1	0	Optimal	0.79	91	91.00	0.00
j12036 1.json	1	0	Solution	60.01	218	199.00	8.72
j12036 10.json	1	0	Solution	60.00	224	197.00	12.05
j12036 2.json	1	0	Solution	60.02	231	201.00	12.99
j12036 3.json	1	0	Solution	60.01	237	217.00	8.44
j12036 4.json	1	0	Solution	60.01	250	215.00	14.00
j12036 5.json	1	0	Solution	60.02	240	210.00	12.50
j12036 6.json	1	0	Solution	60.01	236	204.00	13.56
j12036 7.json	1	0	Solution	60.01	215	195.00	9.30
j12036 8.json	1	0	Solution	60.00	182	152.00	16.48
j12036 9.json	1	0	Solution	60.01	228	198.00	13.16
j12037 1.json	1	0	Solution	60.01	149	138.00	7.38
j12037 10.json	1	0	Solution	60.02	136	127.00	6.62
j12037 2.json	1	0	Solution	60.01	149	141.00	5.37
j12037 3.json	1	0	Solution	60.02	143	135.00	5.59
j12037 4.json	1	0	Solution	60.03	166	156.00	6.02
j12037 5.json	1	0	Solution	60.02	212	194.00	8.49
j12037 6.json	1	0	Solution	60.03	169	154.00	8.88
j12037 7.json	1	0	Solution	60.02	166	150.00	9.64
j12037 8.json	1	0	Solution	60.01	184	166.00	9.78
j12037 9.json	1	0	Solution	60.00	149	138.00	7.38
j12038 1.json	1	0	Solution	60.02	111	105.00	5.41
j12038 10.json	1	0	Solution	60.02	143	137.00	4.20
j12038 2.json	1	0	Solution	60.02	129	119.00	7.75
j12038 3.json	1	0	Solution	60.02	158	153.00	3.16
j12038 4.json	1	0	Solution	60.01	143	138.00	3.50
j12038 5.json	1	0	Solution	60.00	116	110.00	5.17
j12038 6.json	1	0	Solution	60.02	125	118.00	5.60
j12038 7.json	1	0	Solution	60.02	107	102.00	4.67
j12038 8.json	1	0	Solution	60.02	128	121.00	5.47
j12038 9.json	1	0	Solution	60.01	135	134.00	0.74
j12039 1.json	1	0	Optimal	27.11	95	95.00	0.00
j12039 10.json	1	0	Solution	60.00	112	105.00	6.25
j12039 2.json	1	0	Solution	60.02	111	105.00	5.41
j12039 3.json	1	0	Solution	60.02	114	109.00	4.39
j12039 4.json	1	0	Solution	60.01	100	97.00	3.00
j12039 5.json	1	0	Optimal	0.05	106	106.00	0.00
j12039 6.json	1	0	Optimal	0.05	95	95.00	0.00
j12039 7.json	1	0	Solution	60.01	106	101.00	4.72
j12039 8.json	1	0	Solution	60.00	98	93.00	5.10
j12039 9.json	1	0	Solution	60.01	94	89.00	5.32
j1203 1.json	1	0	Optimal	0.96	80	80.00	0.00

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j1203 10.json	1	0	Optimal	0.02	103	103.00	0.00
j1203 2.json	1	0	Optimal	0.02	88	88.00	0.00
j1203 3.json	1	0	Optimal	0.03	100	100.00	0.00
j1203 4.json	1	0	Optimal	0.11	71	71.00	0.00
j1203 5.json	1	0	Optimal	0.05	84	84.00	0.00
j1203 6.json	1	0	Optimal	0.03	102	102.00	0.00
j1203 7.json	1	0	Optimal	0.05	93	93.00	0.00
j1203 8.json	1	0	Optimal	0.03	77	77.00	0.00
j1203 9.json	1	0	Optimal	0.02	86	86.00	0.00
j12040 1.json	1	0	Solution	60.02	82	80.00	2.44
j12040 10.json	1	0	Optimal	0.04	96	96.00	0.00
j12040 2.json	1	0	Optimal	4.82	90	90.00	0.00
j12040 3.json	1	0	Optimal	1.41	87	87.00	0.00
j12040 4.json	1	0	Optimal	0.02	112	112.00	0.00
j12040 5.json	1	0	Optimal	0.03	101	101.00	0.00
j12040 6.json	1	0	Optimal	0.02	90	90.00	0.00
j12040 7.json	1	0	Optimal	0.02	91	91.00	0.00
j12040 8.json	1	0	Optimal	0.03	97	97.00	0.00
j12040 9.json	1	0	Optimal	0.05	117	117.00	0.00
j12041 1.json	1	0	Optimal	0.58	127	127.00	0.00
j12041 10.json	1	0	Optimal	0.85	136	136.00	0.00
j12041 2.json	1	0	Optimal	19.30	141	141.00	0.00
j12041 3.json	1	0	Optimal	1.80	141	141.00	0.00
j12041 4.json	1	0	Optimal	2.32	116	116.00	0.00
j12041 5.json	1	0	Optimal	0.87	138	138.00	0.00
j12041 6.json	1	0	Optimal	1.18	113	113.00	0.00
j12041 7.json	1	0	Optimal	7.03	109	109.00	0.00
j12041 8.json	1	0	Optimal	3.97	138	138.00	0.00
j12041 9.json	1	0	Optimal	5.53	121	121.00	0.00
j12042 1.json	1	0	Solution	60.01	109	104.00	4.59
j12042 10.json	1	0	Optimal	0.89	118	118.00	0.00
j12042 2.json	1	0	Optimal	0.02	126	126.00	0.00
j12042 3.json	1	0	Optimal	0.41	106	106.00	0.00
j12042 4.json	1	0	Optimal	0.43	104	104.00	0.00
j12042 5.json	1	0	Optimal	4.11	120	120.00	0.00
j12042 6.json	1	0	Optimal	2.77	119	119.00	0.00
j12042 7.json	1	0	Optimal	0.03	123	123.00	0.00
j12042 8.json	1	0	Optimal	5.00	113	113.00	0.00
j12042 9.json	1	0	Optimal	0.41	104	104.00	0.00
j12043 1.json	1	0	Optimal	0.02	105	105.00	0.00
j12043 10.json	1	0	Optimal	0.02	113	113.00	0.00
j12043 2.json	1	0	Optimal	0.02	120	120.00	0.00
j12043 3.json	1	0	Optimal	0.06	95	95.00	0.00
j12043 4.json	1	0	Optimal	0.49	105	105.00	0.00
j12043 5.json	1	0	Optimal	0.11	105	105.00	0.00

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12043 6.json	1	0	Optimal	0.86	98	98.00	0.00
j12043 7.json	1	0	Optimal	0.06	122	122.00	0.00
j12043 8.json	1	0	Optimal	0.03	115	115.00	0.00
j12043 9.json	1	0	Optimal	0.03	105	105.00	0.00
j12044 1.json	1	0	Optimal	0.02	100	100.00	0.00
j12044 10.json	1	0	Optimal	0.02	98	98.00	0.00
j12044 2.json	1	0	Optimal	0.13	112	112.00	0.00
j12044 3.json	1	0	Optimal	0.03	107	107.00	0.00
j12044 4.json	1	0	Optimal	0.03	95	95.00	0.00
j12044 5.json	1	0	Optimal	0.03	98	98.00	0.00
j12044 6.json	1	0	Optimal	0.02	106	106.00	0.00
j12044 7.json	1	0	Optimal	0.03	98	98.00	0.00
j12044 8.json	1	0	Optimal	0.14	108	108.00	0.00
j12044 9.json	1	0	Optimal	0.03	91	91.00	0.00
j12045 1.json	1	0	Optimal	0.02	108	108.00	0.00
j12045 10.json	1	0	Optimal	0.02	99	99.00	0.00
j12045 2.json	1	0	Optimal	0.03	91	91.00	0.00
j12045 3.json	1	0	Optimal	0.03	98	98.00	0.00
j12045 4.json	1	0	Optimal	0.03	103	103.00	0.00
j12045 5.json	1	0	Optimal	0.04	116	116.00	0.00
j12045 6.json	1	0	Optimal	0.02	125	125.00	0.00
j12045 7.json	1	0	Optimal	0.02	103	103.00	0.00
j12045 8.json	1	0	Optimal	0.02	103	103.00	0.00
j12045 9.json	1	0	Optimal	0.02	114	114.00	0.00
j12046 1.json	1	0	Solution	60.02	197	158.00	19.80
j12046 10.json	1	0	Solution	60.01	195	168.00	13.85
j12046 2.json	1	0	Solution	60.02	204	174.00	14.71
j12046 3.json	1	0	Solution	60.01	181	150.00	17.13
j12046 4.json	1	0	Solution	60.01	173	154.00	10.98
j12046 5.json	1	0	Solution	60.02	158	137.00	13.29
j12046 6.json	1	0	Solution	60.01	181	157.00	13.26
j12046 7.json	1	0	Solution	60.02	172	149.00	13.37
j12046 8.json	1	0	Solution	60.01	180	156.00	13.33
j12046 9.json	1	0	Solution	60.02	168	146.00	13.10
j12047 1.json	1	0	Solution	60.01	146	120.00	17.81
j12047 10.json	1	0	Solution	60.02	134	130.00	2.99
j12047 2.json	1	0	Solution	60.00	134	122.00	8.96
j12047 3.json	1	0	Solution	60.01	127	120.00	5.51
j12047 4.json	1	0	Solution	60.01	135	120.00	11.11
j12047 5.json	1	0	Solution	60.01	131	120.00	8.40
j12047 6.json	1	0	Solution	60.02	139	129.00	7.19
j12047 7.json	1	0	Solution	60.02	121	113.00	6.61
j12047 8.json	1	0	Solution	60.01	136	120.00	11.76
j12047 9.json	1	0	Solution	60.00	146	136.00	6.85
j12048 1.json	1	0	Optimal	53.72	100	100.00	0.00

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12048 10.json	1	0	Solution	60.02	112	110.00	1.79
j12048 2.json	1	0	Solution	60.01	114	111.00	2.63
j12048 3.json	1	0	Solution	60.01	113	108.00	4.42
j12048 4.json	1	0	Solution	60.01	128	123.00	3.91
j12048 5.json	1	0	Solution	60.01	112	109.00	2.68
j12048 6.json	1	0	Solution	60.01	106	101.00	4.72
j12048 7.json	1	0	Solution	60.04	108	104.00	3.70
j12048 8.json	1	0	Solution	60.01	116	112.00	3.45
j12048 9.json	1	0	Optimal	12.52	113	113.00	0.00
j12049 1.json	1	0	Optimal	0.04	96	96.00	0.00
j12049 10.json	1	0	Solution	60.02	97	96.00	1.03
j12049 2.json	1	0	Solution	60.01	109	105.00	3.67
j12049 3.json	1	0	Solution	60.01	96	95.00	1.04
j12049 4.json	1	0	Solution	60.01	97	95.00	2.06
j12049 5.json	1	0	Optimal	11.35	89	89.00	0.00
j12049 6.json	1	0	Optimal	0.03	128	128.00	0.00
j12049 7.json	1	0	Optimal	5.93	99	99.00	0.00
j12049 8.json	1	0	Optimal	4.76	113	113.00	0.00
j12049 9.json	1	0	Optimal	1.70	97	97.00	0.00
j1204 1.json	1	0	Optimal	0.02	74	74.00	0.00
j1204 10.json	1	0	Optimal	0.02	77	77.00	0.00
j1204 2.json	1	0	Optimal	0.02	107	107.00	0.00
j1204 3.json	1	0	Optimal	0.03	95	95.00	0.00
j1204 4.json	1	0	Optimal	0.02	75	75.00	0.00
j1204 5.json	1	0	Optimal	0.02	74	74.00	0.00
j1204 6.json	1	0	Optimal	0.03	90	90.00	0.00
j1204 7.json	1	0	Optimal	0.02	81	81.00	0.00
j1204 8.json	1	0	Optimal	0.02	90	90.00	0.00
j1204 9.json	1	0	Optimal	0.02	79	79.00	0.00
j12050 1.json	1	0	Optimal	0.03	116	116.00	0.00
j12050 10.json	1	0	Optimal	0.07	103	103.00	0.00
j12050 2.json	1	0	Optimal	4.06	112	112.00	0.00
j12050 3.json	1	0	Optimal	0.03	111	111.00	0.00
j12050 4.json	1	0	Solution	60.02	100	99.00	1.00
j12050 5.json	1	0	Optimal	0.16	100	100.00	0.00
j12050 6.json	1	0	Optimal	0.02	102	102.00	0.00
j12050 7.json	1	0	Optimal	0.03	137	137.00	0.00
j12050 8.json	1	0	Optimal	0.03	112	112.00	0.00
j12050 9.json	1	0	Optimal	0.03	101	101.00	0.00
j12051 1.json	1	0	Solution	60.02	215	178.00	17.21
j12051 10.json	1	0	Solution	60.01	239	192.00	19.67
j12051 2.json	1	0	Solution	60.01	227	191.00	15.86
j12051 3.json	1	0	Solution	60.01	233	190.00	18.45
j12051 4.json	1	0	Solution	60.01	219	195.00	10.96
j12051 5.json	1	0	Solution	60.02	234	194.00	17.09

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12051 6.json	1	0	Solution	60.02	221	188.00	14.93
j12051 7.json	1	0	Solution	60.01	218	180.00	17.43
j12051 8.json	1	0	Solution	60.01	215	182.00	15.35
j12051 9.json	1	0	Solution	60.01	222	187.00	15.77
j12052 1.json	1	0	Solution	60.01	182	154.00	15.38
j12052 10.json	1	0	Solution	60.01	148	133.00	10.14
j12052 2.json	1	0	Solution	60.02	188	167.00	11.17
j12052 3.json	1	0	Solution	60.01	139	124.00	10.79
j12052 4.json	1	0	Solution	60.01	176	157.00	10.80
j12052 5.json	1	0	Solution	60.01	173	157.00	9.25
j12052 6.json	1	0	Solution	60.01	207	182.00	12.08
j12052 7.json	1	0	Solution	60.01	153	142.00	7.19
j12052 8.json	1	0	Solution	60.01	164	147.00	10.37
j12052 9.json	1	0	Solution	60.02	153	142.00	7.19
j12053 1.json	1	0	Solution	60.01	146	137.00	6.16
j12053 10.json	1	0	Solution	60.01	135	124.00	8.15
j12053 2.json	1	0	Solution	60.01	118	109.00	7.63
j12053 3.json	1	0	Solution	60.01	113	106.00	6.19
j12053 4.json	1	0	Solution	60.01	147	137.00	6.80
j12053 5.json	1	0	Solution	60.01	115	109.00	5.22
j12053 6.json	1	0	Solution	60.01	107	101.00	5.61
j12053 7.json	1	0	Solution	60.01	121	116.00	4.13
j12053 8.json	1	0	Solution	60.01	143	135.00	5.59
j12053 9.json	1	0	Solution	60.01	168	150.00	10.71
j12054 1.json	1	0	Solution	60.01	106	101.00	4.72
j12054 10.json	1	0	Solution	60.01	109	105.00	3.67
j12054 2.json	1	0	Optimal	0.03	134	134.00	0.00
j12054 3.json	1	0	Optimal	0.68	111	111.00	0.00
j12054 4.json	1	0	Solution	60.01	121	119.00	1.65
j12054 5.json	1	0	Solution	60.01	111	107.00	3.60
j12054 6.json	1	0	Solution	60.01	110	103.00	6.36
j12054 7.json	1	0	Solution	60.01	112	106.00	5.36
j12054 8.json	1	0	Solution	60.01	103	99.00	3.88
j12054 9.json	1	0	Solution	60.02	108	104.00	3.70
j12055 1.json	1	0	Solution	60.03	102	99.00	2.94
j12055 10.json	1	0	Optimal	0.02	100	100.00	0.00
j12055 2.json	1	0	Optimal	0.03	83	83.00	0.00
j12055 3.json	1	0	Optimal	0.03	126	126.00	0.00
j12055 4.json	1	0	Optimal	0.27	90	90.00	0.00
j12055 5.json	1	0	Optimal	0.03	106	106.00	0.00
j12055 6.json	1	0	Solution	60.01	101	98.00	2.97
j12055 7.json	1	0	Optimal	0.03	105	105.00	0.00
j12055 8.json	1	0	Optimal	1.26	101	101.00	0.00
j12055 9.json	1	0	Optimal	0.05	94	94.00	0.00
j12056 1.json	1	0	Solution	60.00	245	215.00	12.24

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12056 10.json	1	0	Solution	60.02	268	227.00	15.30
j12056 2.json	1	0	Solution	60.03	214	183.00	14.49
j12056 3.json	1	0	Solution	60.01	249	216.00	13.25
j12056 4.json	1	0	Solution	60.00	234	201.00	14.10
j12056 5.json	1	0	Solution	60.02	289	246.00	14.88
j12056 6.json	1	0	Solution	60.01	223	194.00	13.00
j12056 7.json	1	0	Solution	60.01	294	242.00	17.69
j12056 8.json	1	0	Solution	60.01	298	250.00	16.11
j12056 9.json	1	0	Solution	60.02	297	254.00	14.48
j12057 1.json	1	0	Solution	60.01	189	173.00	8.47
j12057 10.json	1	0	Solution	60.01	172	156.00	9.30
j12057 2.json	1	0	Solution	60.01	166	151.00	9.04
j12057 3.json	1	0	Solution	60.01	189	175.00	7.41
j12057 4.json	1	0	Solution	60.01	208	186.00	10.58
j12057 5.json	1	0	Solution	60.02	184	169.00	8.15
j12057 6.json	1	0	Solution	60.01	193	173.00	10.36
j12057 7.json	1	0	Solution	60.01	170	155.00	8.82
j12057 8.json	1	0	Solution	60.02	167	155.00	7.19
j12057 9.json	1	0	Solution	60.01	171	155.00	9.36
j12058 1.json	1	0	Solution	60.01	144	132.00	8.33
j12058 10.json	1	0	Solution	60.02	137	125.00	8.76
j12058 2.json	1	0	Solution	60.01	128	122.00	4.69
j12058 3.json	1	0	Solution	60.01	123	116.00	5.69
j12058 4.json	1	0	Solution	60.02	150	139.00	7.33
j12058 5.json	1	0	Solution	60.02	122	116.00	4.92
j12058 6.json	1	0	Solution	60.02	144	135.00	6.25
j12058 7.json	1	0	Solution	60.02	150	143.00	4.67
j12058 8.json	1	0	Solution	60.02	136	125.00	8.09
j12058 9.json	1	0	Solution	60.02	133	126.00	5.26
j12059 1.json	1	0	Solution	60.01	115	112.00	2.61
j12059 10.json	1	0	Solution	60.02	135	126.00	6.67
j12059 2.json	1	0	Solution	60.02	108	103.00	4.63
j12059 3.json	1	0	Solution	60.02	109	108.00	0.92
j12059 4.json	1	0	Solution	60.02	110	107.00	2.73
j12059 5.json	1	0	Solution	60.02	107	104.00	2.80
j12059 6.json	1	0	Solution	60.02	118	111.00	5.93
j12059 7.json	1	0	Solution	60.02	115	109.00	5.22
j12059 8.json	1	0	Solution	60.02	112	106.00	5.36
j12059 9.json	1	0	Solution	60.02	119	117.00	1.68
j1205 1.json	1	0	Optimal	0.02	92	92.00	0.00
j1205 10.json	1	0	Optimal	0.02	92	92.00	0.00
j1205 2.json	1	0	Optimal	0.02	80	80.00	0.00
j1205 3.json	1	0	Optimal	0.02	72	72.00	0.00
j1205 4.json	1	0	Optimal	0.02	97	97.00	0.00
j1205 5.json	1	0	Optimal	0.02	77	77.00	0.00

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j1205 6.json	1	0	Optimal	0.02	88	88.00	0.00
j1205 7.json	1	0	Optimal	0.02	84	84.00	0.00
j1205 8.json	1	0	Optimal	0.03	78	78.00	0.00
j1205 9.json	1	0	Optimal	0.03	106	106.00	0.00
j12060 1.json	1	0	Optimal	0.03	101	101.00	0.00
j12060 10.json	1	0	Solution	60.02	90	88.00	2.22
j12060 2.json	1	0	Solution	60.01	84	81.00	3.57
j12060 3.json	1	0	Solution	60.01	90	88.00	2.22
j12060 4.json	1	0	Solution	60.02	104	101.00	2.88
j12060 5.json	1	0	Solution	60.02	106	103.00	2.83
j12060 6.json	1	0	Optimal	0.05	110	110.00	0.00
j12060 7.json	1	0	Solution	60.01	95	90.00	5.26
j12060 8.json	1	0	Optimal	36.75	101	101.00	0.00
j12060 9.json	1	0	Optimal	0.02	101	101.00	0.00
j1206 1.json	1	0	Solution	60.01	150	132.00	12.00
j1206 10.json	1	0	Solution	60.02	178	157.00	11.80
j1206 2.json	1	0	Solution	60.01	140	126.00	10.00
j1206 3.json	1	0	Solution	60.01	137	126.00	8.03
j1206 4.json	1	0	Solution	60.01	157	143.00	8.92
j1206 5.json	1	0	Solution	60.01	129	116.00	10.08
j1206 6.json	1	0	Solution	60.01	158	138.00	12.66
j1206 7.json	1	0	Solution	60.01	172	152.00	11.63
j1206 8.json	1	0	Solution	60.02	150	137.00	8.67
j1206 9.json	1	0	Solution	60.02	164	144.00	12.20
j1207 1.json	1	0	Solution	60.01	104	98.00	5.77
j1207 10.json	1	0	Solution	60.01	121	111.00	8.26
j1207 2.json	1	0	Solution	60.01	116	112.00	3.45
j1207 3.json	1	0	Solution	60.02	102	97.00	4.90
j1207 4.json	1	0	Solution	60.01	115	106.00	7.83
j1207 5.json	1	0	Solution	60.01	135	126.00	6.67
j1207 6.json	1	0	Solution	60.01	129	114.00	11.63
j1207 7.json	1	0	Solution	60.01	120	114.00	5.00
j1207 8.json	1	0	Solution	60.01	99	93.00	6.06
j1207 9.json	1	0	Solution	60.02	91	86.00	5.49
j1208 1.json	1	0	Optimal	0.56	95	95.00	0.00
j1208 10.json	1	0	Solution	60.01	94	92.00	2.13
j1208 2.json	1	0	Solution	60.01	105	100.00	4.76
j1208 3.json	1	0	Solution	60.02	96	94.00	2.08
j1208 4.json	1	0	Solution	60.01	95	90.00	5.26
j1208 5.json	1	0	Solution	60.01	105	100.00	4.76
j1208 6.json	1	0	Solution	60.01	85	84.00	1.18
j1208 7.json	1	0	Solution	60.02	88	87.00	1.14
j1208 8.json	1	0	Solution	60.01	88	87.00	1.14
j1208 9.json	1	0	Solution	60.02	95	90.00	5.26
j1209 1.json	1	0	Optimal	0.04	88	88.00	0.00

Table 9.7: Results for RCPSP J120 (CPO) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j1209 10.json	1	0	Optimal	0.05	84	84.00	0.00
j1209 2.json	1	0	Optimal	0.03	94	94.00	0.00
j1209 3.json	1	0	Optimal	0.02	87	87.00	0.00
j1209 4.json	1	0	Solution	60.01	87	84.00	3.45
j1209 5.json	1	0	Optimal	0.03	114	114.00	0.00
j1209 6.json	1	0	Optimal	2.12	98	98.00	0.00
j1209 7.json	1	0	Optimal	0.02	80	80.00	0.00
j1209 8.json	1	0	Optimal	0.03	80	80.00	0.00
j1209 9.json	1	0	Optimal	0.10	87	87.00	0.00

9.4.2 CPSat

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12010 1.json	1	0	Optimal	0.11	111	111.00	0.00
j12010 10.json	1	0	Optimal	0.06	66	66.00	0.00
j12010 2.json	1	0	Optimal	0.07	91	91.00	0.00
j12010 3.json	1	0	Optimal	0.10	99	99.00	0.00
j12010 4.json	1	0	Optimal	0.14	95	95.00	0.00
j12010 5.json	1	0	Optimal	0.10	97	97.00	0.00
j12010 6.json	1	0	Optimal	0.03	92	92.00	0.00
j12010 7.json	1	0	Optimal	0.36	79	79.00	0.00
j12010 8.json	1	0	Optimal	0.17	114	114.00	0.00
j12010 9.json	1	0	Optimal	0.04	77	77.00	0.00
j12011 1.json	1	0	Solution	60.03	183	155.00	15.30
j12011 10.json	1	0	Solution	60.03	194	163.00	15.98
j12011 2.json	1	0	Solution	60.05	166	145.00	12.65
j12011 3.json	1	0	Solution	60.04	219	187.00	14.61
j12011 4.json	1	0	Solution	60.03	210	176.00	16.19
j12011 5.json	1	0	Solution	60.03	224	192.00	14.29
j12011 6.json	1	0	Solution	60.07	223	187.00	16.14
j12011 7.json	1	0	Solution	60.04	172	148.00	13.95
j12011 8.json	1	0	Solution	60.04	173	152.00	12.14
j12011 9.json	1	0	Solution	60.05	184	168.00	8.70
j12012 1.json	1	0	Solution	60.05	146	125.00	14.38
j12012 10.json	1	0	Solution	60.04	148	142.00	4.05
j12012 2.json	1	0	Solution	60.02	124	111.00	10.48
j12012 3.json	1	0	Solution	60.03	142	132.00	7.04
j12012 4.json	1	0	Solution	60.03	129	121.00	6.20
j12012 5.json	1	0	Solution	60.07	169	154.00	8.88
j12012 6.json	1	0	Solution	60.06	129	115.00	10.85

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12012 7.json	1	0	Solution	60.03	124	116.00	6.45
j12012 8.json	1	0	Solution	60.03	125	113.00	9.60
j12012 9.json	1	0	Solution	60.01	109	101.00	7.34
j12013 1.json	1	0	Solution	60.03	131	122.00	6.87
j12013 10.json	1	0	Solution	60.03	97	88.00	9.28
j12013 2.json	1	0	Solution	60.04	90	88.00	2.22
j12013 3.json	1	0	Solution	60.02	120	115.00	4.17
j12013 4.json	1	0	Solution	60.01	116	108.00	6.90
j12013 5.json	1	0	Solution	60.03	94	90.00	4.26
j12013 6.json	1	0	Solution	60.02	102	95.00	6.86
j12013 7.json	1	0	Solution	60.03	112	107.00	4.46
j12013 8.json	1	0	Solution	60.02	96	91.00	5.21
j12013 9.json	1	0	Solution	60.03	87	82.00	5.75
j12014 1.json	1	0	Solution	60.03	87	84.00	3.45
j12014 10.json	1	0	Solution	60.03	83	80.00	3.61
j12014 2.json	1	0	Solution	60.02	95	90.00	5.26
j12014 3.json	1	0	Optimal	28.27	88	88.00	0.00
j12014 4.json	1	0	Solution	60.02	89	85.00	4.49
j12014 5.json	1	0	Solution	60.03	99	93.00	6.06
j12014 6.json	1	0	Optimal	60.01	91	91.00	0.00
j12014 7.json	1	0	Solution	60.03	92	89.00	3.26
j12014 8.json	1	0	Solution	60.03	113	109.00	3.54
j12014 9.json	1	0	Optimal	0.15	101	101.00	0.00
j12015 1.json	1	0	Optimal	0.10	81	81.00	0.00
j12015 10.json	1	0	Optimal	0.10	91	91.00	0.00
j12015 2.json	1	0	Optimal	0.04	75	75.00	0.00
j12015 3.json	1	0	Optimal	0.10	87	87.00	0.00
j12015 4.json	1	0	Optimal	0.10	82	82.00	0.00
j12015 5.json	1	0	Optimal	0.09	87	87.00	0.00
j12015 6.json	1	0	Optimal	0.08	97	97.00	0.00
j12015 7.json	1	0	Optimal	0.05	75	75.00	0.00
j12015 8.json	1	0	Optimal	0.07	126	126.00	0.00
j12015 9.json	1	0	Optimal	0.06	109	109.00	0.00
j12016 1.json	1	0	Solution	60.05	212	178.00	16.04
j12016 10.json	1	0	Solution	60.04	228	201.00	11.84
j12016 2.json	1	0	Solution	60.04	253	220.00	13.04
j12016 3.json	1	0	Solution	60.02	252	219.00	13.10
j12016 4.json	1	0	Solution	60.05	213	188.00	11.74
j12016 5.json	1	0	Solution	60.05	213	181.00	15.02
j12016 6.json	1	0	Solution	60.05	217	193.00	11.06
j12016 7.json	1	0	Solution	60.03	199	172.00	13.57
j12016 8.json	1	0	Solution	60.05	206	181.00	12.14
j12016 9.json	1	0	Solution	60.09	223	187.00	16.14
j12017 1.json	1	0	Solution	60.02	147	133.00	9.52
j12017 10.json	1	0	Solution	60.03	141	121.00	14.18

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12017 2.json	1	0	Solution	60.02	130	110.00	15.38
j12017 3.json	1	0	Solution	60.03	113	98.00	13.27
j12017 4.json	1	0	Solution	60.03	124	108.00	12.90
j12017 5.json	1	0	Solution	60.02	136	122.00	10.29
j12017 6.json	1	0	Solution	60.02	143	131.00	8.39
j12017 7.json	1	0	Solution	60.02	153	140.00	8.50
j12017 8.json	1	0	Solution	60.03	132	124.00	6.06
j12017 9.json	1	0	Solution	60.03	142	127.00	10.56
j12018 1.json	1	0	Solution	60.03	142	115.00	19.01
j12018 10.json	1	0	Solution	60.04	100	90.00	10.00
j12018 2.json	1	0	Solution	60.02	121	111.00	8.26
j12018 3.json	1	0	Solution	60.02	103	90.00	12.62
j12018 4.json	1	0	Solution	60.02	104	96.00	7.69
j12018 5.json	1	0	Solution	60.02	123	106.00	13.82
j12018 6.json	1	0	Solution	60.03	139	124.00	10.79
j12018 7.json	1	0	Solution	60.02	122	111.00	9.02
j12018 8.json	1	0	Solution	60.04	108	95.00	12.04
j12018 9.json	1	0	Solution	60.03	95	83.00	12.63
j12019 1.json	1	0	Optimal	0.10	88	88.00	0.00
j12019 10.json	1	0	Optimal	0.06	88	88.00	0.00
j12019 2.json	1	0	Solution	60.02	84	81.00	3.57
j12019 3.json	1	0	Solution	60.03	88	82.00	6.82
j12019 4.json	1	0	Solution	60.02	109	97.00	11.01
j12019 5.json	1	0	Solution	60.03	108	99.00	8.33
j12019 6.json	1	0	Solution	60.02	92	80.00	13.04
j12019 7.json	1	0	Optimal	0.09	93	93.00	0.00
j12019 8.json	1	0	Solution	60.03	95	93.00	2.11
j12019 9.json	1	0	Solution	60.02	90	75.00	16.67
j1201 1.json	1	0	Solution	60.02	105	104.00	0.95
j1201 10.json	1	0	Optimal	15.90	108	108.00	0.00
j1201 2.json	1	0	Optimal	1.55	109	109.00	0.00
j1201 3.json	1	0	Solution	60.06	126	118.00	6.35
j1201 4.json	1	0	Optimal	0.79	97	97.00	0.00
j1201 5.json	1	0	Optimal	0.74	112	112.00	0.00
j1201 6.json	1	0	Optimal	0.71	84	84.00	0.00
j1201 7.json	1	0	Optimal	4.35	117	117.00	0.00
j1201 8.json	1	0	Optimal	60.02	109	109.00	0.00
j1201 9.json	1	0	Optimal	0.33	112	112.00	0.00
j12020 1.json	1	0	Optimal	60.02	89	89.00	0.00
j12020 10.json	1	0	Optimal	0.09	81	81.00	0.00
j12020 2.json	1	0	Optimal	0.08	99	99.00	0.00
j12020 3.json	1	0	Solution	60.02	78	74.00	5.13
j12020 4.json	1	0	Optimal	0.08	89	89.00	0.00
j12020 5.json	1	0	Optimal	0.08	69	69.00	0.00
j12020 6.json	1	0	Optimal	0.07	80	80.00	0.00

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12020 7.json	1	0	Optimal	0.07	81	81.00	0.00
j12020 8.json	1	0	Optimal	60.01	107	107.00	0.00
j12020 9.json	1	0	Optimal	0.07	80	80.00	0.00
j12021 1.json	1	0	Optimal	60.01	114	114.00	0.00
j12021 10.json	1	0	Optimal	13.02	102	102.00	0.00
j12021 2.json	1	0	Optimal	37.55	117	117.00	0.00
j12021 3.json	1	0	Optimal	1.65	143	143.00	0.00
j12021 4.json	1	0	Optimal	11.74	135	135.00	0.00
j12021 5.json	1	0	Optimal	5.01	110	110.00	0.00
j12021 6.json	1	0	Optimal	1.60	109	109.00	0.00
j12021 7.json	1	0	Optimal	5.83	111	111.00	0.00
j12021 8.json	1	0	Optimal	0.23	127	127.00	0.00
j12021 9.json	1	0	Optimal	0.41	102	102.00	0.00
j12022 1.json	1	0	Optimal	1.52	101	101.00	0.00
j12022 10.json	1	0	Optimal	0.17	79	79.00	0.00
j12022 2.json	1	0	Optimal	0.18	107	107.00	0.00
j12022 3.json	1	0	Optimal	60.01	96	96.00	0.00
j12022 4.json	1	0	Optimal	0.19	90	90.00	0.00
j12022 5.json	1	0	Optimal	0.18	93	93.00	0.00
j12022 6.json	1	0	Optimal	0.21	103	103.00	0.00
j12022 7.json	1	0	Optimal	0.09	133	133.00	0.00
j12022 8.json	1	0	Optimal	3.11	103	103.00	0.00
j12022 9.json	1	0	Optimal	0.21	109	109.00	0.00
j12023 1.json	1	0	Optimal	0.09	107	107.00	0.00
j12023 10.json	1	0	Optimal	0.14	100	100.00	0.00
j12023 2.json	1	0	Optimal	0.08	116	116.00	0.00
j12023 3.json	1	0	Optimal	0.10	99	99.00	0.00
j12023 4.json	1	0	Optimal	0.15	106	106.00	0.00
j12023 5.json	1	0	Optimal	0.09	99	99.00	0.00
j12023 6.json	1	0	Optimal	0.12	106	106.00	0.00
j12023 7.json	1	0	Optimal	0.14	104	104.00	0.00
j12023 8.json	1	0	Optimal	0.15	101	101.00	0.00
j12023 9.json	1	0	Optimal	0.13	107	107.00	0.00
j12024 1.json	1	0	Optimal	0.06	93	93.00	0.00
j12024 10.json	1	0	Optimal	0.14	91	91.00	0.00
j12024 2.json	1	0	Optimal	0.12	91	91.00	0.00
j12024 3.json	1	0	Optimal	0.10	89	89.00	0.00
j12024 4.json	1	0	Optimal	0.12	101	101.00	0.00
j12024 5.json	1	0	Optimal	0.10	86	86.00	0.00
j12024 6.json	1	0	Optimal	0.09	95	95.00	0.00
j12024 7.json	1	0	Optimal	0.12	112	112.00	0.00
j12024 8.json	1	0	Optimal	0.13	104	104.00	0.00
j12024 9.json	1	0	Optimal	0.12	82	82.00	0.00
j12025 1.json	1	0	Optimal	0.12	82	82.00	0.00
j12025 10.json	1	0	Optimal	0.05	92	92.00	0.00

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12025 2.json	1	0	Optimal	0.10	108	108.00	0.00
j12025 3.json	1	0	Optimal	0.06	100	100.00	0.00
j12025 4.json	1	0	Optimal	0.05	117	117.00	0.00
j12025 5.json	1	0	Optimal	0.05	100	100.00	0.00
j12025 6.json	1	0	Optimal	0.07	92	92.00	0.00
j12025 7.json	1	0	Optimal	0.12	92	92.00	0.00
j12025 8.json	1	0	Optimal	0.10	80	80.00	0.00
j12025 9.json	1	0	Optimal	0.05	94	94.00	0.00
j12026 1.json	1	0	Solution	60.03	173	150.00	13.29
j12026 10.json	1	0	Solution	60.02	186	160.00	13.98
j12026 2.json	1	0	Solution	60.06	172	150.00	12.79
j12026 3.json	1	0	Solution	60.04	172	154.00	10.47
j12026 4.json	1	0	Solution	60.07	177	151.00	14.69
j12026 5.json	1	0	Solution	60.05	159	136.00	14.47
j12026 6.json	1	0	Solution	60.03	190	170.00	10.53
j12026 7.json	1	0	Solution	60.03	161	143.00	11.18
j12026 8.json	1	0	Solution	60.06	178	159.00	10.67
j12026 9.json	1	0	Solution	60.03	178	160.00	10.11
j12027 1.json	1	0	Solution	60.03	110	105.00	4.55
j12027 10.json	1	0	Solution	60.02	117	108.00	7.69
j12027 2.json	1	0	Solution	60.05	116	108.00	6.90
j12027 3.json	1	0	Solution	60.07	149	141.00	5.37
j12027 4.json	1	0	Solution	60.09	110	104.00	5.45
j12027 5.json	1	0	Solution	60.03	114	102.00	10.53
j12027 6.json	1	0	Solution	60.05	150	132.00	12.00
j12027 7.json	1	0	Solution	60.08	126	115.00	8.73
j12027 8.json	1	0	Solution	60.07	144	135.00	6.25
j12027 9.json	1	0	Solution	60.05	128	120.00	6.25
j12028 1.json	1	0	Solution	60.04	110	105.00	4.55
j12028 10.json	1	0	Solution	60.03	117	111.00	5.13
j12028 2.json	1	0	Optimal	60.02	110	110.00	0.00
j12028 3.json	1	0	Optimal	0.20	101	101.00	0.00
j12028 4.json	1	0	Optimal	60.02	112	112.00	0.00
j12028 5.json	1	0	Optimal	0.21	102	102.00	0.00
j12028 6.json	1	0	Optimal	3.89	103	103.00	0.00
j12028 7.json	1	0	Solution	60.02	109	103.00	5.50
j12028 8.json	1	0	Solution	60.05	100	97.00	3.00
j12028 9.json	1	0	Solution	60.03	98	96.00	2.04
j12029 1.json	1	0	Optimal	0.12	104	104.00	0.00
j12029 10.json	1	0	Optimal	0.14	96	96.00	0.00
j12029 2.json	1	0	Optimal	0.12	91	91.00	0.00
j12029 3.json	1	0	Solution	60.05	98	94.00	4.08
j12029 4.json	1	0	Optimal	0.88	80	80.00	0.00
j12029 5.json	1	0	Optimal	0.58	102	102.00	0.00
j12029 6.json	1	0	Solution	60.03	92	88.00	4.35

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12029 7.json	1	0	Optimal	0.11	97	97.00	0.00
j12029 8.json	1	0	Optimal	0.63	80	80.00	0.00
j12029 9.json	1	0	Optimal	0.11	97	97.00	0.00
j1202 1.json	1	0	Optimal	7.10	87	87.00	0.00
j1202 10.json	1	0	Optimal	0.38	96	96.00	0.00
j1202 2.json	1	0	Optimal	1.81	75	75.00	0.00
j1202 3.json	1	0	Optimal	5.29	92	92.00	0.00
j1202 4.json	1	0	Optimal	0.19	95	95.00	0.00
j1202 5.json	1	0	Optimal	0.39	103	103.00	0.00
j1202 6.json	1	0	Optimal	0.29	92	92.00	0.00
j1202 7.json	1	0	Optimal	0.17	90	90.00	0.00
j1202 8.json	1	0	Optimal	0.19	83	83.00	0.00
j1202 9.json	1	0	Optimal	6.64	94	94.00	0.00
j12030 1.json	1	0	Optimal	0.08	102	102.00	0.00
j12030 10.json	1	0	Optimal	0.08	86	86.00	0.00
j12030 2.json	1	0	Optimal	0.09	112	112.00	0.00
j12030 3.json	1	0	Optimal	0.08	108	108.00	0.00
j12030 4.json	1	0	Optimal	0.09	83	83.00	0.00
j12030 5.json	1	0	Optimal	53.55	83	83.00	0.00
j12030 6.json	1	0	Optimal	0.05	79	79.00	0.00
j12030 7.json	1	0	Optimal	0.57	93	93.00	0.00
j12030 8.json	1	0	Optimal	0.07	79	79.00	0.00
j12030 9.json	1	0	Optimal	0.10	93	93.00	0.00
j12031 1.json	1	0	Solution	60.06	205	179.00	12.68
j12031 10.json	1	0	Solution	60.03	241	199.00	17.43
j12031 2.json	1	0	Solution	60.04	202	174.00	13.86
j12031 3.json	1	0	Solution	60.04	183	158.00	13.66
j12031 4.json	1	0	Solution	60.03	235	186.00	20.85
j12031 5.json	1	0	Solution	60.03	213	185.00	13.15
j12031 6.json	1	0	Solution	60.04	204	181.00	11.27
j12031 7.json	1	0	Solution	60.02	218	190.00	12.84
j12031 8.json	1	0	Solution	60.03	203	173.00	14.78
j12031 9.json	1	0	Solution	60.07	206	175.00	15.05
j12032 1.json	1	0	Solution	60.03	150	143.00	4.67
j12032 10.json	1	0	Solution	60.03	137	125.00	8.76
j12032 2.json	1	0	Solution	60.03	139	122.00	12.23
j12032 3.json	1	0	Solution	60.04	152	133.00	12.50
j12032 4.json	1	0	Solution	60.04	141	126.00	10.64
j12032 5.json	1	0	Solution	60.04	144	132.00	8.33
j12032 6.json	1	0	Solution	60.02	134	121.00	9.70
j12032 7.json	1	0	Solution	60.03	127	118.00	7.09
j12032 8.json	1	0	Solution	60.04	141	131.00	7.09
j12032 9.json	1	0	Solution	60.03	132	124.00	6.06
j12033 1.json	1	0	Solution	60.03	110	104.00	5.45
j12033 10.json	1	0	Solution	60.03	111	102.00	8.11

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12033 2.json	1	0	Solution	60.03	117	105.00	10.26
j12033 3.json	1	0	Solution	60.03	111	101.00	9.01
j12033 4.json	1	0	Solution	60.03	117	105.00	10.26
j12033 5.json	1	0	Solution	60.03	148	132.00	10.81
j12033 6.json	1	0	Solution	60.05	118	115.00	2.54
j12033 7.json	1	0	Solution	60.02	126	121.00	3.97
j12033 8.json	1	0	Solution	60.02	114	106.00	7.02
j12033 9.json	1	0	Solution	60.03	120	108.00	10.00
j12034 1.json	1	0	Solution	60.01	79	75.00	5.06
j12034 10.json	1	0	Optimal	0.18	101	101.00	0.00
j12034 2.json	1	0	Solution	60.02	107	102.00	4.67
j12034 3.json	1	0	Solution	60.02	103	98.00	4.85
j12034 4.json	1	0	Optimal	8.06	95	95.00	0.00
j12034 5.json	1	0	Solution	60.03	105	101.00	3.81
j12034 6.json	1	0	Optimal	0.29	100	100.00	0.00
j12034 7.json	1	0	Optimal	14.52	105	105.00	0.00
j12034 8.json	1	0	Solution	60.02	90	85.00	5.56
j12034 9.json	1	0	Solution	60.03	97	90.00	7.22
j12035 1.json	1	0	Optimal	0.09	87	87.00	0.00
j12035 10.json	1	0	Optimal	0.10	86	86.00	0.00
j12035 2.json	1	0	Solution	60.03	112	111.00	0.89
j12035 3.json	1	0	Optimal	60.01	77	77.00	0.00
j12035 4.json	1	0	Optimal	0.12	101	101.00	0.00
j12035 5.json	1	0	Optimal	60.01	92	92.00	0.00
j12035 6.json	1	0	Optimal	0.07	86	86.00	0.00
j12035 7.json	1	0	Optimal	0.08	99	99.00	0.00
j12035 8.json	1	0	Optimal	0.11	101	101.00	0.00
j12035 9.json	1	0	Optimal	29.79	91	91.00	0.00
j12036 1.json	1	0	Solution	60.04	222	186.00	16.22
j12036 10.json	1	0	Solution	60.03	231	191.00	17.32
j12036 2.json	1	0	Solution	60.11	238	201.00	15.55
j12036 3.json	1	0	Solution	60.04	243	216.00	11.11
j12036 4.json	1	0	Solution	60.04	257	215.00	16.34
j12036 5.json	1	0	Solution	60.09	247	208.00	15.79
j12036 6.json	1	0	Solution	60.04	244	201.00	17.62
j12036 7.json	1	0	Solution	60.04	220	193.00	12.27
j12036 8.json	1	0	Solution	60.03	185	151.00	18.38
j12036 9.json	1	0	Solution	60.13	233	200.00	14.16
j12037 1.json	1	0	Solution	60.02	151	137.00	9.27
j12037 10.json	1	0	Solution	60.03	138	126.00	8.70
j12037 2.json	1	0	Solution	60.03	152	132.00	13.16
j12037 3.json	1	0	Solution	60.03	146	125.00	14.38
j12037 4.json	1	0	Solution	60.05	170	147.00	13.53
j12037 5.json	1	0	Solution	60.03	217	191.00	11.98
j12037 6.json	1	0	Solution	60.04	172	140.00	18.60

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12037 7.json	1	0	Solution	60.03	168	148.00	11.90
j12037 8.json	1	0	Solution	60.03	189	165.00	12.70
j12037 9.json	1	0	Solution	60.04	151	126.00	16.56
j12038 1.json	1	0	Solution	60.03	111	104.00	6.31
j12038 10.json	1	0	Solution	60.02	145	114.00	21.38
j12038 2.json	1	0	Solution	60.03	131	117.00	10.69
j12038 3.json	1	0	Solution	60.03	161	147.00	8.70
j12038 4.json	1	0	Solution	60.03	145	122.00	15.86
j12038 5.json	1	0	Solution	60.03	117	101.00	13.68
j12038 6.json	1	0	Solution	60.02	127	109.00	14.17
j12038 7.json	1	0	Solution	60.03	108	97.00	10.19
j12038 8.json	1	0	Solution	60.03	129	108.00	16.28
j12038 9.json	1	0	Solution	60.03	138	134.00	2.90
j12039 1.json	1	0	Optimal	60.01	95	95.00	0.00
j12039 10.json	1	0	Solution	60.02	113	99.00	12.39
j12039 2.json	1	0	Solution	60.03	112	104.00	7.14
j12039 3.json	1	0	Solution	60.02	114	103.00	9.65
j12039 4.json	1	0	Solution	60.02	101	89.00	11.88
j12039 5.json	1	0	Optimal	0.12	106	106.00	0.00
j12039 6.json	1	0	Optimal	0.23	95	95.00	0.00
j12039 7.json	1	0	Solution	60.01	108	94.00	12.96
j12039 8.json	1	0	Solution	60.04	100	93.00	7.00
j12039 9.json	1	0	Solution	60.03	95	87.00	8.42
j1203 1.json	1	0	Optimal	0.25	80	80.00	0.00
j1203 10.json	1	0	Optimal	0.13	103	103.00	0.00
j1203 2.json	1	0	Optimal	0.11	88	88.00	0.00
j1203 3.json	1	0	Optimal	0.11	100	100.00	0.00
j1203 4.json	1	0	Optimal	0.12	71	71.00	0.00
j1203 5.json	1	0	Optimal	0.12	84	84.00	0.00
j1203 6.json	1	0	Optimal	0.12	102	102.00	0.00
j1203 7.json	1	0	Optimal	0.09	93	93.00	0.00
j1203 8.json	1	0	Optimal	0.17	77	77.00	0.00
j1203 9.json	1	0	Optimal	0.12	86	86.00	0.00
j12040 1.json	1	0	Solution	60.03	82	78.00	4.88
j12040 10.json	1	0	Optimal	0.10	96	96.00	0.00
j12040 2.json	1	0	Optimal	0.53	90	90.00	0.00
j12040 3.json	1	0	Optimal	60.01	87	87.00	0.00
j12040 4.json	1	0	Optimal	0.07	112	112.00	0.00
j12040 5.json	1	0	Optimal	0.08	101	101.00	0.00
j12040 6.json	1	0	Optimal	0.06	90	90.00	0.00
j12040 7.json	1	0	Optimal	0.07	91	91.00	0.00
j12040 8.json	1	0	Optimal	0.09	97	97.00	0.00
j12040 9.json	1	0	Optimal	0.16	117	117.00	0.00
j12041 1.json	1	0	Optimal	0.34	127	127.00	0.00
j12041 10.json	1	0	Optimal	0.86	136	136.00	0.00

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12041 2.json	1	0	Optimal	26.27	141	141.00	0.00
j12041 3.json	1	0	Optimal	3.91	141	141.00	0.00
j12041 4.json	1	0	Optimal	1.15	116	116.00	0.00
j12041 5.json	1	0	Optimal	0.32	138	138.00	0.00
j12041 6.json	1	0	Optimal	1.61	113	113.00	0.00
j12041 7.json	1	0	Optimal	4.27	109	109.00	0.00
j12041 8.json	1	0	Optimal	2.72	138	138.00	0.00
j12041 9.json	1	0	Optimal	60.01	121	121.00	0.00
j12042 1.json	1	0	Solution	60.15	108	105.00	2.78
j12042 10.json	1	0	Optimal	1.19	118	118.00	0.00
j12042 2.json	1	0	Optimal	0.07	126	126.00	0.00
j12042 3.json	1	0	Optimal	0.23	106	106.00	0.00
j12042 4.json	1	0	Optimal	0.18	104	104.00	0.00
j12042 5.json	1	0	Optimal	22.61	120	120.00	0.00
j12042 6.json	1	0	Optimal	13.42	119	119.00	0.00
j12042 7.json	1	0	Optimal	0.18	123	123.00	0.00
j12042 8.json	1	0	Optimal	60.00	113	113.00	0.00
j12042 9.json	1	0	Optimal	0.17	104	104.00	0.00
j12043 1.json	1	0	Optimal	0.13	105	105.00	0.00
j12043 10.json	1	0	Optimal	0.15	113	113.00	0.00
j12043 2.json	1	0	Optimal	0.13	120	120.00	0.00
j12043 3.json	1	0	Optimal	0.15	95	95.00	0.00
j12043 4.json	1	0	Optimal	0.17	105	105.00	0.00
j12043 5.json	1	0	Optimal	0.15	105	105.00	0.00
j12043 6.json	1	0	Optimal	0.92	98	98.00	0.00
j12043 7.json	1	0	Optimal	0.16	122	122.00	0.00
j12043 8.json	1	0	Optimal	0.12	115	115.00	0.00
j12043 9.json	1	0	Optimal	0.14	105	105.00	0.00
j12044 1.json	1	0	Optimal	0.11	100	100.00	0.00
j12044 10.json	1	0	Optimal	0.12	98	98.00	0.00
j12044 2.json	1	0	Optimal	0.12	112	112.00	0.00
j12044 3.json	1	0	Optimal	0.09	107	107.00	0.00
j12044 4.json	1	0	Optimal	0.07	95	95.00	0.00
j12044 5.json	1	0	Optimal	0.12	98	98.00	0.00
j12044 6.json	1	0	Optimal	0.13	106	106.00	0.00
j12044 7.json	1	0	Optimal	0.12	98	98.00	0.00
j12044 8.json	1	0	Optimal	0.09	108	108.00	0.00
j12044 9.json	1	0	Optimal	0.11	91	91.00	0.00
j12045 1.json	1	0	Optimal	0.10	108	108.00	0.00
j12045 10.json	1	0	Optimal	0.12	99	99.00	0.00
j12045 2.json	1	0	Optimal	0.09	91	91.00	0.00
j12045 3.json	1	0	Optimal	0.09	98	98.00	0.00
j12045 4.json	1	0	Optimal	0.10	103	103.00	0.00
j12045 5.json	1	0	Optimal	0.10	116	116.00	0.00
j12045 6.json	1	0	Optimal	0.04	125	125.00	0.00

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12045 7.json	1	0	Optimal	0.09	103	103.00	0.00
j12045 8.json	1	0	Optimal	0.13	103	103.00	0.00
j12045 9.json	1	0	Optimal	0.06	114	114.00	0.00
j12046 1.json	1	0	Solution	60.15	193	159.00	17.62
j12046 10.json	1	0	Solution	60.05	191	173.00	9.42
j12046 2.json	1	0	Solution	60.03	199	174.00	12.56
j12046 3.json	1	0	Solution	60.07	183	153.00	16.39
j12046 4.json	1	0	Solution	60.05	173	162.00	6.36
j12046 5.json	1	0	Solution	60.04	154	135.00	12.34
j12046 6.json	1	0	Solution	60.07	181	159.00	12.15
j12046 7.json	1	0	Solution	60.08	173	155.00	10.40
j12046 8.json	1	0	Solution	60.03	181	157.00	13.26
j12046 9.json	1	0	Solution	60.04	170	147.00	13.53
j12047 1.json	1	0	Solution	60.06	140	121.00	13.57
j12047 10.json	1	0	Solution	60.02	135	127.00	5.93
j12047 2.json	1	0	Solution	60.09	133	120.00	9.77
j12047 3.json	1	0	Solution	60.02	127	118.00	7.09
j12047 4.json	1	0	Solution	60.05	137	117.00	14.60
j12047 5.json	1	0	Solution	60.03	129	119.00	7.75
j12047 6.json	1	0	Solution	60.03	142	127.00	10.56
j12047 7.json	1	0	Solution	60.04	122	112.00	8.20
j12047 8.json	1	0	Solution	60.04	138	122.00	11.59
j12047 9.json	1	0	Solution	60.05	146	136.00	6.85
j12048 1.json	1	0	Optimal	60.02	100	100.00	0.00
j12048 10.json	1	0	Solution	60.06	111	106.00	4.50
j12048 2.json	1	0	Solution	60.04	114	111.00	2.63
j12048 3.json	1	0	Solution	60.05	114	106.00	7.02
j12048 4.json	1	0	Solution	60.03	129	121.00	6.20
j12048 5.json	1	0	Solution	60.03	111	104.00	6.31
j12048 6.json	1	0	Solution	60.03	106	99.00	6.60
j12048 7.json	1	0	Solution	60.05	107	102.00	4.67
j12048 8.json	1	0	Solution	60.03	116	109.00	6.03
j12048 9.json	1	0	Optimal	60.02	113	113.00	0.00
j12049 1.json	1	0	Optimal	0.11	96	96.00	0.00
j12049 10.json	1	0	Solution	60.09	97	95.00	2.06
j12049 2.json	1	0	Solution	60.03	109	104.00	4.59
j12049 3.json	1	0	Optimal	60.02	96	96.00	0.00
j12049 4.json	1	0	Solution	60.03	97	94.00	3.09
j12049 5.json	1	0	Optimal	60.01	89	89.00	0.00
j12049 6.json	1	0	Optimal	0.16	128	128.00	0.00
j12049 7.json	1	0	Optimal	3.41	99	99.00	0.00
j12049 8.json	1	0	Optimal	49.19	113	113.00	0.00
j12049 9.json	1	0	Optimal	7.50	97	97.00	0.00
j1204 1.json	1	0	Optimal	0.11	74	74.00	0.00
j1204 10.json	1	0	Optimal	0.08	77	77.00	0.00

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j1204 2.json	1	0	Optimal	0.09	107	107.00	0.00
j1204 3.json	1	0	Optimal	0.09	95	95.00	0.00
j1204 4.json	1	0	Optimal	0.10	75	75.00	0.00
j1204 5.json	1	0	Optimal	0.09	74	74.00	0.00
j1204 6.json	1	0	Optimal	0.11	90	90.00	0.00
j1204 7.json	1	0	Optimal	0.10	81	81.00	0.00
j1204 8.json	1	0	Optimal	0.05	90	90.00	0.00
j1204 9.json	1	0	Optimal	0.07	79	79.00	0.00
j12050 1.json	1	0	Optimal	0.07	116	116.00	0.00
j12050 10.json	1	0	Optimal	0.15	103	103.00	0.00
j12050 2.json	1	0	Optimal	8.68	112	112.00	0.00
j12050 3.json	1	0	Optimal	0.11	111	111.00	0.00
j12050 4.json	1	0	Solution	60.04	100	98.00	2.00
j12050 5.json	1	0	Optimal	0.12	100	100.00	0.00
j12050 6.json	1	0	Optimal	0.09	102	102.00	0.00
j12050 7.json	1	0	Optimal	0.09	137	137.00	0.00
j12050 8.json	1	0	Optimal	0.11	112	112.00	0.00
j12050 9.json	1	0	Optimal	0.09	101	101.00	0.00
j12051 1.json	1	0	Solution	60.05	221	180.00	18.55
j12051 10.json	1	0	Solution	60.05	238	193.00	18.91
j12051 2.json	1	0	Solution	60.03	233	192.00	17.60
j12051 3.json	1	0	Solution	60.07	235	189.00	19.57
j12051 4.json	1	0	Solution	60.04	222	196.00	11.71
j12051 5.json	1	0	Solution	60.02	244	193.00	20.90
j12051 6.json	1	0	Solution	60.07	225	190.00	15.56
j12051 7.json	1	0	Solution	60.03	220	179.00	18.64
j12051 8.json	1	0	Solution	60.05	216	184.00	14.81
j12051 9.json	1	0	Solution	60.03	228	188.00	17.54
j12052 1.json	1	0	Solution	60.04	183	157.00	14.21
j12052 10.json	1	0	Solution	60.03	150	129.00	14.00
j12052 2.json	1	0	Solution	60.04	192	167.00	13.02
j12052 3.json	1	0	Solution	60.05	141	124.00	12.06
j12052 4.json	1	0	Solution	60.04	178	155.00	12.92
j12052 5.json	1	0	Solution	60.04	174	157.00	9.77
j12052 6.json	1	0	Solution	60.04	208	181.00	12.98
j12052 7.json	1	0	Solution	60.09	155	139.00	10.32
j12052 8.json	1	0	Solution	60.02	166	147.00	11.45
j12052 9.json	1	0	Solution	60.09	154	141.00	8.44
j12053 1.json	1	0	Solution	60.04	149	137.00	8.05
j12053 10.json	1	0	Solution	60.03	136	123.00	9.56
j12053 2.json	1	0	Solution	60.05	119	108.00	9.24
j12053 3.json	1	0	Solution	60.02	114	105.00	7.89
j12053 4.json	1	0	Solution	60.03	148	136.00	8.11
j12053 5.json	1	0	Solution	60.04	115	108.00	6.09
j12053 6.json	1	0	Solution	60.09	109	100.00	8.26

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12053 7.json	1	0	Solution	60.02	121	116.00	4.13
j12053 8.json	1	0	Solution	60.05	142	134.00	5.63
j12053 9.json	1	0	Solution	60.03	168	149.00	11.31
j12054 1.json	1	0	Solution	60.09	106	101.00	4.72
j12054 10.json	1	0	Solution	60.06	108	104.00	3.70
j12054 2.json	1	0	Optimal	0.13	134	134.00	0.00
j12054 3.json	1	0	Optimal	1.35	111	111.00	0.00
j12054 4.json	1	0	Solution	60.06	120	119.00	0.83
j12054 5.json	1	0	Solution	60.05	111	106.00	4.50
j12054 6.json	1	0	Solution	60.05	111	103.00	7.21
j12054 7.json	1	0	Solution	60.04	112	103.00	8.04
j12054 8.json	1	0	Solution	60.03	104	99.00	4.81
j12054 9.json	1	0	Solution	60.04	108	104.00	3.70
j12055 1.json	1	0	Solution	60.03	101	99.00	1.98
j12055 10.json	1	0	Optimal	0.15	100	100.00	0.00
j12055 2.json	1	0	Optimal	0.08	83	83.00	0.00
j12055 3.json	1	0	Optimal	0.10	126	126.00	0.00
j12055 4.json	1	0	Optimal	0.14	90	90.00	0.00
j12055 5.json	1	0	Optimal	0.09	106	106.00	0.00
j12055 6.json	1	0	Solution	60.04	102	98.00	3.92
j12055 7.json	1	0	Optimal	0.09	105	105.00	0.00
j12055 8.json	1	0	Optimal	7.76	101	101.00	0.00
j12055 9.json	1	0	Optimal	0.10	94	94.00	0.00
j12056 1.json	1	0	Solution	60.04	255	214.00	16.08
j12056 10.json	1	0	Solution	60.05	275	228.00	17.09
j12056 2.json	1	0	Solution	60.15	221	183.00	17.19
j12056 3.json	1	0	Solution	60.04	257	214.00	16.73
j12056 4.json	1	0	Solution	60.05	240	199.00	17.08
j12056 5.json	1	0	Solution	60.04	298	242.00	18.79
j12056 6.json	1	0	Solution	60.03	230	194.00	15.65
j12056 7.json	1	0	Solution	60.03	299	242.00	19.06
j12056 8.json	1	0	Solution	60.05	304	244.00	19.74
j12056 9.json	1	0	Solution	60.03	306	254.00	16.99
j12057 1.json	1	0	Solution	60.07	198	169.00	14.65
j12057 10.json	1	0	Solution	60.04	173	153.00	11.56
j12057 2.json	1	0	Solution	60.04	169	147.00	13.02
j12057 3.json	1	0	Solution	60.04	192	173.00	9.90
j12057 4.json	1	0	Solution	60.03	208	183.00	12.02
j12057 5.json	1	0	Solution	60.03	190	167.00	12.11
j12057 6.json	1	0	Solution	60.04	200	171.00	14.50
j12057 7.json	1	0	Solution	60.04	174	153.00	12.07
j12057 8.json	1	0	Solution	60.03	172	149.00	13.37
j12057 9.json	1	0	Solution	60.05	176	154.00	12.50
j12058 1.json	1	0	Solution	60.03	146	130.00	10.96
j12058 10.json	1	0	Solution	60.08	138	123.00	10.87

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j12058 2.json	1	0	Solution	60.03	130	113.00	13.08
j12058 3.json	1	0	Solution	60.04	125	113.00	9.60
j12058 4.json	1	0	Solution	60.03	152	128.00	15.79
j12058 5.json	1	0	Solution	60.04	123	107.00	13.01
j12058 6.json	1	0	Solution	60.03	146	127.00	13.01
j12058 7.json	1	0	Solution	60.04	155	132.00	14.84
j12058 8.json	1	0	Solution	60.04	138	124.00	10.14
j12058 9.json	1	0	Solution	60.04	135	117.00	13.33
j12059 1.json	1	0	Solution	60.03	116	110.00	5.17
j12059 10.json	1	0	Solution	60.04	136	124.00	8.82
j12059 2.json	1	0	Solution	60.03	108	93.00	13.89
j12059 3.json	1	0	Optimal	60.02	108	108.00	0.00
j12059 4.json	1	0	Solution	60.01	112	107.00	4.46
j12059 5.json	1	0	Solution	60.03	108	100.00	7.41
j12059 6.json	1	0	Solution	60.03	117	107.00	8.55
j12059 7.json	1	0	Solution	60.03	115	108.00	6.09
j12059 8.json	1	0	Solution	60.01	113	100.00	11.50
j12059 9.json	1	0	Solution	60.07	120	115.00	4.17
j1205 1.json	1	0	Optimal	0.04	92	92.00	0.00
j1205 10.json	1	0	Optimal	0.06	92	92.00	0.00
j1205 2.json	1	0	Optimal	0.07	80	80.00	0.00
j1205 3.json	1	0	Optimal	0.09	72	72.00	0.00
j1205 4.json	1	0	Optimal	0.06	97	97.00	0.00
j1205 5.json	1	0	Optimal	0.05	77	77.00	0.00
j1205 6.json	1	0	Optimal	0.11	88	88.00	0.00
j1205 7.json	1	0	Optimal	0.06	84	84.00	0.00
j1205 8.json	1	0	Optimal	0.11	78	78.00	0.00
j1205 9.json	1	0	Optimal	0.12	106	106.00	0.00
j12060 1.json	1	0	Optimal	0.09	101	101.00	0.00
j12060 10.json	1	0	Solution	60.03	90	85.00	5.56
j12060 2.json	1	0	Solution	60.03	84	81.00	3.57
j12060 3.json	1	0	Solution	60.02	91	81.00	10.99
j12060 4.json	1	0	Solution	60.02	105	101.00	3.81
j12060 5.json	1	0	Solution	60.02	106	96.00	9.43
j12060 6.json	1	0	Optimal	0.08	110	110.00	0.00
j12060 7.json	1	0	Solution	60.04	97	88.00	9.28
j12060 8.json	1	0	Solution	60.04	102	101.00	0.98
j12060 9.json	1	0	Optimal	0.08	101	101.00	0.00
j1206 1.json	1	0	Solution	60.03	152	133.00	12.50
j1206 10.json	1	0	Solution	60.04	178	156.00	12.36
j1206 2.json	1	0	Solution	60.05	141	125.00	11.35
j1206 3.json	1	0	Solution	60.05	135	125.00	7.41
j1206 4.json	1	0	Solution	60.14	156	144.00	7.69
j1206 5.json	1	0	Solution	60.04	129	116.00	10.08
j1206 6.json	1	0	Solution	60.04	158	140.00	11.39

Table 9.8: Results for RCPSP J120 (CPSat) (600 Instances)

Name	Nr Jobs	Nr Machines	Status	Time	Makespan	Bound	Gap Percent
j1206 7.json	1	0	Solution	60.03	172	151.00	12.21
j1206 8.json	1	0	Solution	60.05	150	140.00	6.67
j1206 9.json	1	0	Solution	60.04	164	146.00	10.98
j1207 1.json	1	0	Solution	60.03	105	98.00	6.67
j1207 10.json	1	0	Solution	60.02	122	111.00	9.02
j1207 2.json	1	0	Solution	60.03	114	106.00	7.02
j1207 3.json	1	0	Solution	60.04	100	94.00	6.00
j1207 4.json	1	0	Solution	60.04	116	105.00	9.48
j1207 5.json	1	0	Solution	60.06	137	125.00	8.76
j1207 6.json	1	0	Solution	60.03	126	115.00	8.73
j1207 7.json	1	0	Solution	60.06	120	113.00	5.83
j1207 8.json	1	0	Solution	60.03	100	92.00	8.00
j1207 9.json	1	0	Solution	60.04	92	86.00	6.52
j1208 1.json	1	0	Optimal	0.72	95	95.00	0.00
j1208 10.json	1	0	Solution	60.02	94	91.00	3.19
j1208 2.json	1	0	Solution	60.04	104	97.00	6.73
j1208 3.json	1	0	Solution	60.05	95	93.00	2.11
j1208 4.json	1	0	Solution	60.01	95	89.00	6.32
j1208 5.json	1	0	Solution	60.05	107	99.00	7.48
j1208 6.json	1	0	Solution	60.03	85	83.00	2.35
j1208 7.json	1	0	Solution	60.02	88	87.00	1.14
j1208 8.json	1	0	Solution	60.03	89	87.00	2.25
j1208 9.json	1	0	Solution	60.02	96	88.00	8.33
j1209 1.json	1	0	Optimal	0.12	88	88.00	0.00
j1209 10.json	1	0	Optimal	0.13	84	84.00	0.00
j1209 2.json	1	0	Optimal	0.10	94	94.00	0.00
j1209 3.json	1	0	Optimal	0.18	87	87.00	0.00
j1209 4.json	1	0	Solution	60.02	87	84.00	3.45
j1209 5.json	1	0	Optimal	0.07	114	114.00	0.00
j1209 6.json	1	0	Optimal	60.01	98	98.00	0.00
j1209 7.json	1	0	Optimal	0.09	80	80.00	0.00
j1209 8.json	1	0	Optimal	0.07	80	80.00	0.00
j1209 9.json	1	0	Optimal	0.27	87	87.00	0.00

Chapter 10

Result Comparison for SALBP

Table 10.1: Result Comparison for SALBP

Instance	SALOME		CPO	CPSat	Direct		Alternative	
	LB	UB			Cplex	Chuffed	CPO	CPSat
1000 1	135	135	136	136	n/a	n/a	136	136
1000 10	140	140	141	141	n/a	n/a	141	141
1000 100	137	137	139	139	n/a	n/a	138	n/a
1000 101	515	550	558	565	n/a	n/a	552	n/a
1000 102	522	551	557	562	n/a	n/a	551	n/a
1000 103	522	556	562	567	n/a	n/a	557	n/a
1000 104	515	555	555	556	n/a	n/a	544	n/a
1000 105	510	541	549	552	n/a	n/a	540	n/a
1000 106	526	557	556	557	n/a	n/a	546	n/a
1000 107	501	539	540	543	n/a	n/a	533	n/a
1000 108	508	553	546	552	n/a	n/a	540	n/a
1000 109	513	556	550	550	n/a	n/a	546	n/a
1000 11	134	134	135	136	n/a	n/a	135	135
1000 110	516	555	557	566	n/a	n/a	553	n/a
1000 111	509	541	550	552	n/a	n/a	539	n/a
1000 112	509	550	550	548	n/a	n/a	545	n/a
1000 113	496	549	543	546	n/a	n/a	539	n/a
1000 114	512	553	552	555	n/a	n/a	544	n/a
1000 115	503	550	542	545	n/a	n/a	537	n/a
1000 116	499	542	546	554	n/a	n/a	536	n/a
1000 117	512	550	552	556	n/a	n/a	546	n/a
1000 118	524	570	566	566	n/a	n/a	557	n/a
1000 119	501	538	532	536	n/a	n/a	527	n/a
1000 12	134	134	135	135	n/a	n/a	134	135
1000 120	518	561	549	556	n/a	n/a	546	n/a
1000 121	496	536	542	546	n/a	n/a	537	n/a
1000 122	493	528	535	537	n/a	n/a	527	n/a

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 123	513	548	557	562	n/a	n/a	549	n/a
1000 124	504	541	544	548	n/a	n/a	535	n/a
1000 125	507	546	546	550	n/a	n/a	538	n/a
1000 126	228	231	232	233	n/a	n/a	231	n/a
1000 127	221	223	224	224	n/a	n/a	223	n/a
1000 128	222	225	225	226	n/a	n/a	225	n/a
1000 129	223	223	226	227	n/a	n/a	225	225
1000 13	131	131	132	133	n/a	n/a	132	132
1000 130	221	223	225	225	n/a	n/a	224	n/a
1000 131	220	220	223	224	n/a	n/a	222	n/a
1000 132	214	217	218	218	n/a	n/a	217	n/a
1000 133	226	227	230	230	n/a	n/a	229	n/a
1000 134	215	215	219	219	n/a	n/a	218	n/a
1000 135	225	228	229	230	n/a	n/a	228	n/a
1000 136	228	230	233	233	n/a	n/a	230	n/a
1000 137	213	215	217	216	n/a	n/a	215	n/a
1000 138	221	224	225	225	n/a	n/a	223	n/a
1000 139	224	227	228	228	n/a	n/a	226	n/a
1000 14	136	136	138	138	n/a	n/a	137	138
1000 140	226	228	230	230	n/a	n/a	228	n/a
1000 141	215	219	219	219	n/a	n/a	217	n/a
1000 142	220	223	223	224	n/a	n/a	222	n/a
1000 143	213	216	217	217	n/a	n/a	215	n/a
1000 144	217	220	221	221	n/a	n/a	219	n/a
1000 145	220	223	224	224	n/a	n/a	222	n/a
1000 146	219	222	224	223	n/a	n/a	222	n/a
1000 147	229	232	234	234	n/a	n/a	232	n/a
1000 148	219	219	223	223	n/a	n/a	221	n/a
1000 149	237	240	241	241	n/a	n/a	239	n/a
1000 15	136	136	137	137	n/a	n/a	136	137
1000 150	222	225	226	226	n/a	n/a	224	n/a
1000 151	138	138	140	140	n/a	n/a	139	139
1000 152	136	136	138	138	n/a	n/a	137	138
1000 153	137	137	139	139	n/a	n/a	138	138
1000 154	140	140	142	142	n/a	n/a	141	141
1000 155	139	139	141	141	n/a	n/a	140	141
1000 156	141	141	143	143	n/a	n/a	142	143
1000 157	140	140	142	142	n/a	n/a	141	141
1000 158	136	136	137	137	n/a	n/a	136	137
1000 159	138	138	140	140	n/a	n/a	139	139
1000 16	137	137	138	138	n/a	n/a	138	138
1000 160	138	138	140	140	n/a	n/a	139	140
1000 161	133	133	134	134	n/a	n/a	133	134
1000 162	136	136	137	138	n/a	n/a	136	137
1000 163	139	139	141	141	n/a	n/a	140	141

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 164	141	141	143	143	n/a	n/a	142	143
1000 165	135	135	137	137	n/a	n/a	136	137
1000 166	139	139	141	141	n/a	n/a	140	141
1000 167	139	139	141	141	n/a	n/a	140	141
1000 168	138	138	140	140	n/a	n/a	139	140
1000 169	134	134	136	136	n/a	n/a	135	136
1000 17	135	135	136	136	n/a	n/a	135	136
1000 170	134	134	136	136	n/a	n/a	135	136
1000 171	137	137	139	139	n/a	n/a	138	138
1000 172	135	135	136	136	n/a	n/a	136	136
1000 173	135	135	137	137	n/a	n/a	136	136
1000 174	136	136	138	138	n/a	n/a	137	137
1000 175	138	138	140	140	n/a	n/a	139	140
1000 176	507	529	559	577	n/a	n/a	538	561
1000 177	505	528	552	568	n/a	n/a	534	547
1000 178	521	547	568	573	n/a	n/a	555	564
1000 179	516	546	565	580	n/a	n/a	547	565
1000 18	134	134	135	135	n/a	n/a	134	135
1000 180	522	544	563	580	n/a	n/a	556	566
1000 181	515	553	567	584	n/a	n/a	552	566
1000 182	513	538	561	576	n/a	n/a	546	560
1000 183	510	534	552	564	n/a	n/a	543	554
1000 184	510	540	562	575	n/a	n/a	547	557
1000 185	512	540	565	567	n/a	n/a	547	557
1000 186	505	533	557	570	n/a	n/a	540	552
1000 187	520	556	569	584	n/a	n/a	556	565
1000 188	504	527	553	571	n/a	n/a	538	551
1000 189	501	534	556	567	n/a	n/a	540	552
1000 19	137	137	138	138	n/a	n/a	137	138
1000 190	512	535	556	573	n/a	n/a	547	556
1000 191	510	541	555	575	n/a	n/a	543	557
1000 192	507	530	559	568	n/a	n/a	544	556
1000 193	511	535	564	582	n/a	n/a	546	568
1000 194	508	532	561	580	n/a	n/a	542	558
1000 195	517	538	567	576	n/a	n/a	554	565
1000 196	515	537	561	574	n/a	n/a	547	559
1000 197	499	524	550	558	n/a	n/a	525	543
1000 198	515	544	566	580	n/a	n/a	549	565
1000 199	497	525	542	555	n/a	n/a	527	541
1000 2	137	137	138	138	n/a	n/a	138	138
1000 20	138	138	139	139	n/a	n/a	138	139
1000 200	500	537	554	566	n/a	n/a	534	546
1000 201	229	231	233	234	n/a	n/a	231	232
1000 202	225	225	230	230	n/a	n/a	228	229
1000 203	229	232	234	235	n/a	n/a	232	233

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 204	228	230	233	233	n/a	n/a	231	232
1000 205	229	231	234	236	n/a	n/a	231	233
1000 206	229	230	233	233	n/a	n/a	231	233
1000 207	230	230	235	235	n/a	n/a	232	233
1000 208	229	231	234	234	n/a	n/a	232	233
1000 209	228	228	233	233	n/a	n/a	231	232
1000 21	138	138	139	139	n/a	n/a	139	139
1000 210	224	224	229	229	n/a	n/a	226	228
1000 211	219	221	223	224	n/a	n/a	221	223
1000 212	217	219	221	221	n/a	n/a	219	220
1000 213	233	236	238	238	n/a	n/a	236	238
1000 214	225	226	230	230	n/a	n/a	227	229
1000 215	223	224	227	229	n/a	n/a	225	227
1000 216	221	222	225	225	n/a	n/a	223	224
1000 217	225	227	229	230	n/a	n/a	228	229
1000 218	219	221	223	223	n/a	n/a	221	222
1000 219	232	233	236	238	n/a	n/a	235	235
1000 22	137	137	139	138	n/a	n/a	138	138
1000 220	225	227	229	230	n/a	n/a	227	228
1000 221	231	233	236	236	n/a	n/a	234	235
1000 222	221	222	226	227	n/a	n/a	224	225
1000 223	221	222	226	226	n/a	n/a	224	225
1000 224	226	227	231	232	n/a	n/a	229	230
1000 225	229	231	234	235	n/a	n/a	232	233
1000 226	136	136	138	138	n/a	n/a	137	138
1000 227	138	138	140	139	n/a	n/a	139	n/a
1000 228	133	133	135	135	n/a	n/a	135	135
1000 229	134	134	136	136	n/a	n/a	135	136
1000 23	136	136	137	137	n/a	n/a	137	137
1000 230	131	131	134	133	n/a	n/a	132	133
1000 231	138	138	141	140	n/a	n/a	139	140
1000 232	133	133	136	135	n/a	n/a	134	135
1000 233	135	135	138	137	n/a	n/a	137	137
1000 234	137	137	139	139	n/a	n/a	138	139
1000 235	133	133	134	135	n/a	n/a	134	135
1000 236	136	136	138	138	n/a	n/a	137	138
1000 237	138	138	141	140	n/a	n/a	140	140
1000 238	138	138	140	140	n/a	n/a	139	140
1000 239	135	135	137	137	n/a	n/a	136	136
1000 24	140	140	141	141	n/a	n/a	141	141
1000 240	135	135	138	137	n/a	n/a	137	137
1000 241	138	138	140	140	n/a	n/a	139	140
1000 242	135	135	137	137	n/a	n/a	136	137
1000 243	137	137	139	139	n/a	n/a	138	139
1000 244	137	137	139	139	n/a	n/a	138	139

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 245	135	135	137	137	n/a	n/a	136	137
1000 246	135	135	138	137	n/a	n/a	136	137
1000 247	138	138	141	141	n/a	n/a	140	140
1000 248	138	138	141	141	n/a	n/a	140	141
1000 249	138	138	141	140	n/a	n/a	139	140
1000 25	136	136	137	137	n/a	n/a	136	137
1000 250	140	140	142	142	n/a	n/a	141	142
1000 251	516	557	575	587	n/a	n/a	561	n/a
1000 252	512	558	574	583	n/a	n/a	563	n/a
1000 253	511	557	568	580	n/a	n/a	561	n/a
1000 254	511	555	569	582	n/a	n/a	559	n/a
1000 255	504	546	561	569	n/a	n/a	550	n/a
1000 256	496	546	562	570	n/a	n/a	551	n/a
1000 257	517	558	575	584	n/a	n/a	564	n/a
1000 258	502	549	565	579	n/a	n/a	557	n/a
1000 259	498	544	563	571	n/a	n/a	547	n/a
1000 26	515	532	555	570	n/a	n/a	541	553
1000 260	495	542	562	568	n/a	n/a	549	n/a
1000 261	509	548	570	581	n/a	n/a	558	n/a
1000 262	501	538	551	563	n/a	n/a	540	557
1000 263	514	545	567	572	n/a	n/a	558	n/a
1000 264	500	551	562	578	n/a	n/a	556	n/a
1000 265	527	568	586	594	n/a	n/a	574	n/a
1000 266	507	543	566	574	n/a	n/a	556	n/a
1000 267	519	566	576	590	n/a	n/a	565	n/a
1000 268	504	537	562	567	n/a	n/a	547	n/a
1000 269	503	553	561	570	n/a	n/a	553	n/a
1000 27	516	536	554	569	n/a	n/a	542	550
1000 270	532	570	584	603	n/a	n/a	581	n/a
1000 271	501	545	557	567	n/a	n/a	546	n/a
1000 272	516	554	572	584	n/a	n/a	562	n/a
1000 273	512	550	569	578	n/a	n/a	561	n/a
1000 274	507	551	565	583	n/a	n/a	555	n/a
1000 275	516	563	574	586	n/a	n/a	568	n/a
1000 276	217	220	223	223	n/a	n/a	220	222
1000 277	225	227	231	231	n/a	n/a	229	230
1000 278	220	220	226	226	n/a	n/a	224	226
1000 279	215	218	220	220	n/a	n/a	219	220
1000 28	510	523	538	557	n/a	n/a	531	534
1000 280	226	229	231	232	n/a	n/a	229	n/a
1000 281	219	223	225	225	n/a	n/a	223	226
1000 282	214	215	220	220	n/a	n/a	218	219
1000 283	224	224	230	231	n/a	n/a	228	230
1000 284	217	220	222	222	n/a	n/a	220	222
1000 285	221	225	227	228	n/a	n/a	225	227

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 286	221	224	227	227	n/a	n/a	225	226
1000 287	224	227	230	230	n/a	n/a	227	229
1000 288	219	222	225	225	n/a	n/a	223	224
1000 289	220	223	225	225	n/a	n/a	224	226
1000 29	507	524	545	560	n/a	n/a	530	540
1000 290	222	224	228	229	n/a	n/a	226	228
1000 291	225	227	231	230	n/a	n/a	228	230
1000 292	226	228	232	232	n/a	n/a	230	231
1000 293	225	225	231	232	n/a	n/a	228	231
1000 294	230	234	236	236	n/a	n/a	234	n/a
1000 295	227	228	233	233	n/a	n/a	231	232
1000 296	208	211	213	213	n/a	n/a	211	212
1000 297	217	218	222	222	n/a	n/a	220	221
1000 298	214	217	220	220	n/a	n/a	218	220
1000 299	226	230	232	233	n/a	n/a	230	n/a
1000 3	136	136	138	138	n/a	n/a	137	138
1000 30	528	548	559	573	n/a	n/a	548	556
1000 300	228	232	234	235	n/a	n/a	232	233
1000 301	137	137	138	138	n/a	n/a	138	138
1000 302	139	139	140	140	n/a	n/a	139	140
1000 303	138	138	140	140	n/a	n/a	139	140
1000 304	136	136	138	138	n/a	n/a	137	137
1000 305	140	140	141	141	n/a	n/a	140	141
1000 306	135	135	136	136	n/a	n/a	136	136
1000 307	136	136	137	137	n/a	n/a	136	137
1000 308	137	137	138	139	n/a	n/a	138	138
1000 309	135	135	136	136	n/a	n/a	135	136
1000 31	520	536	558	571	n/a	n/a	543	548
1000 310	141	141	143	143	n/a	n/a	142	143
1000 311	139	139	141	141	n/a	n/a	140	140
1000 312	135	135	136	136	n/a	n/a	135	136
1000 313	138	138	139	139	n/a	n/a	139	139
1000 314	142	142	143	143	n/a	n/a	142	143
1000 315	136	136	138	138	n/a	n/a	137	138
1000 316	137	137	139	139	n/a	n/a	138	138
1000 317	136	136	137	137	n/a	n/a	137	137
1000 318	138	138	139	139	n/a	n/a	139	139
1000 319	140	140	142	142	n/a	n/a	141	141
1000 32	507	527	543	567	n/a	n/a	531	536
1000 320	141	141	142	142	n/a	n/a	142	142
1000 321	140	140	141	141	n/a	n/a	141	141
1000 322	139	139	140	140	n/a	n/a	139	140
1000 323	138	138	140	140	n/a	n/a	139	139
1000 324	140	140	141	142	n/a	n/a	141	141
1000 325	138	138	140	140	n/a	n/a	139	139

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 326	504	523	542	561	n/a	n/a	529	537
1000 327	509	536	554	573	n/a	n/a	540	548
1000 328	506	532	546	558	n/a	n/a	528	538
1000 329	509	535	555	569	n/a	n/a	539	548
1000 33	509	531	548	561	n/a	n/a	537	544
1000 330	509	522	538	553	n/a	n/a	527	535
1000 331	502	531	547	559	n/a	n/a	530	537
1000 332	497	524	535	549	n/a	n/a	522	533
1000 333	515	539	554	569	n/a	n/a	542	549
1000 334	501	520	540	554	n/a	n/a	522	536
1000 335	511	526	544	555	n/a	n/a	532	544
1000 336	502	528	534	552	n/a	n/a	523	533
1000 337	515	535	551	570	n/a	n/a	539	548
1000 338	512	540	553	563	n/a	n/a	535	549
1000 339	526	542	556	566	n/a	n/a	540	550
1000 34	534	551	563	579	n/a	n/a	555	560
1000 340	531	545	566	575	n/a	n/a	551	558
1000 341	513	539	552	572	n/a	n/a	543	550
1000 342	506	530	549	567	n/a	n/a	535	547
1000 343	510	540	556	568	n/a	n/a	541	548
1000 344	510	531	546	563	n/a	n/a	533	545
1000 345	510	538	554	567	n/a	n/a	540	548
1000 346	505	528	552	562	n/a	n/a	531	543
1000 347	505	531	547	561	n/a	n/a	538	543
1000 348	539	553	566	578	n/a	n/a	557	563
1000 349	512	535	559	570	n/a	n/a	542	550
1000 35	506	529	544	563	n/a	n/a	531	536
1000 350	498	526	534	555	n/a	n/a	525	529
1000 351	227	229	231	232	n/a	n/a	230	230
1000 352	227	229	231	232	n/a	n/a	229	229
1000 353	217	218	221	221	n/a	n/a	219	220
1000 354	222	224	226	227	n/a	n/a	224	225
1000 355	220	222	224	224	n/a	n/a	222	223
1000 356	226	227	230	231	n/a	n/a	228	229
1000 357	213	214	217	217	n/a	n/a	215	216
1000 358	219	220	223	223	n/a	n/a	221	222
1000 359	222	224	226	226	n/a	n/a	224	225
1000 36	502	527	538	556	n/a	n/a	529	530
1000 360	229	230	233	234	n/a	n/a	232	232
1000 361	215	215	219	219	n/a	n/a	217	218
1000 362	223	224	226	227	n/a	n/a	225	225
1000 363	215	217	219	219	n/a	n/a	217	218
1000 364	221	222	225	226	n/a	n/a	223	224
1000 365	227	229	231	233	n/a	n/a	230	230
1000 366	228	230	232	232	n/a	n/a	230	230

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 367	227	228	231	232	n/a	n/a	229	230
1000 368	226	228	230	230	n/a	n/a	228	229
1000 369	220	221	224	224	n/a	n/a	223	223
1000 37	529	547	562	581	n/a	n/a	550	558
1000 370	223	224	227	227	n/a	n/a	226	226
1000 371	220	221	223	223	n/a	n/a	222	222
1000 372	230	232	234	236	n/a	n/a	233	233
1000 373	219	220	223	222	n/a	n/a	221	221
1000 374	219	220	222	222	n/a	n/a	221	221
1000 375	227	229	231	230	n/a	n/a	229	229
1000 376	132	132	134	134	n/a	n/a	133	134
1000 377	137	137	139	139	n/a	n/a	138	138
1000 378	134	134	136	136	n/a	n/a	135	136
1000 379	137	137	139	139	n/a	n/a	138	139
1000 38	519	546	557	574	n/a	n/a	545	552
1000 380	134	134	136	136	n/a	n/a	135	136
1000 381	138	138	140	140	n/a	n/a	139	139
1000 382	131	131	133	133	n/a	n/a	132	132
1000 383	138	138	141	140	n/a	n/a	139	140
1000 384	139	139	141	141	n/a	n/a	140	141
1000 385	135	135	137	137	n/a	n/a	137	138
1000 386	139	139	141	140	n/a	n/a	140	140
1000 387	137	137	139	139	n/a	n/a	138	139
1000 388	137	137	139	138	n/a	n/a	138	138
1000 389	136	136	138	137	n/a	n/a	137	137
1000 39	520	539	561	575	n/a	n/a	545	550
1000 390	136	136	138	138	n/a	n/a	137	137
1000 391	135	135	137	137	n/a	n/a	136	137
1000 392	136	136	137	137	n/a	n/a	137	137
1000 393	136	136	138	138	n/a	n/a	137	137
1000 394	138	138	140	140	n/a	n/a	140	140
1000 395	139	139	141	141	n/a	n/a	140	141
1000 396	136	136	138	138	n/a	n/a	137	138
1000 397	140	140	142	142	n/a	n/a	141	141
1000 398	134	134	136	136	n/a	n/a	135	136
1000 399	139	139	140	140	n/a	n/a	140	140
1000 4	138	138	139	140	n/a	n/a	139	139
1000 40	504	520	531	543	n/a	n/a	521	523
1000 400	140	140	142	142	n/a	n/a	141	142
1000 401	500	547	556	561	n/a	n/a	543	n/a
1000 402	518	565	567	569	n/a	n/a	555	n/a
1000 403	511	557	562	567	n/a	n/a	553	n/a
1000 404	505	550	557	566	n/a	n/a	550	n/a
1000 405	514	557	567	571	n/a	n/a	563	n/a
1000 406	497	542	552	552	n/a	n/a	538	n/a

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 407	500	548	564	567	n/a	n/a	551	n/a
1000 408	520	567	568	571	n/a	n/a	558	n/a
1000 409	512	559	568	574	n/a	n/a	551	n/a
1000 41	505	525	544	568	n/a	n/a	529	535
1000 410	523	561	580	593	n/a	n/a	570	n/a
1000 411	504	541	563	569	n/a	n/a	549	n/a
1000 412	509	547	565	571	n/a	n/a	558	n/a
1000 413	515	547	567	568	n/a	n/a	553	n/a
1000 414	505	557	563	566	n/a	n/a	550	n/a
1000 415	509	553	564	571	n/a	n/a	550	n/a
1000 416	520	561	567	578	n/a	n/a	558	n/a
1000 417	550	585	592	594	n/a	n/a	583	n/a
1000 418	507	548	560	566	n/a	n/a	550	n/a
1000 419	537	574	583	592	n/a	n/a	575	n/a
1000 42	499	524	533	549	n/a	n/a	520	527
1000 420	512	551	565	565	n/a	n/a	555	n/a
1000 421	506	546	561	565	n/a	n/a	554	n/a
1000 422	499	546	560	562	n/a	n/a	546	n/a
1000 423	515	557	565	576	n/a	n/a	559	n/a
1000 424	496	545	553	555	n/a	n/a	542	n/a
1000 425	527	563	572	577	n/a	n/a	563	n/a
1000 426	224	227	229	229	n/a	n/a	227	228
1000 427	229	232	235	235	n/a	n/a	233	234
1000 428	224	227	228	228	n/a	n/a	227	228
1000 429	235	237	240	240	n/a	n/a	238	239
1000 43	504	533	534	552	n/a	n/a	524	527
1000 430	220	223	224	224	n/a	n/a	223	224
1000 431	230	232	235	235	n/a	n/a	233	234
1000 432	227	230	232	232	n/a	n/a	231	232
1000 433	229	233	234	234	n/a	n/a	233	233
1000 434	212	214	215	215	n/a	n/a	214	215
1000 435	227	230	232	232	n/a	n/a	230	231
1000 436	226	230	231	231	n/a	n/a	230	231
1000 437	222	225	227	227	n/a	n/a	225	225
1000 438	221	224	226	226	n/a	n/a	224	225
1000 439	225	228	230	230	n/a	n/a	228	229
1000 44	508	525	552	565	n/a	n/a	543	548
1000 440	225	225	230	230	n/a	n/a	228	229
1000 441	221	225	226	226	n/a	n/a	225	225
1000 442	230	234	235	235	n/a	n/a	233	235
1000 443	217	220	222	222	n/a	n/a	220	220
1000 444	222	225	227	226	n/a	n/a	225	226
1000 445	229	233	235	236	n/a	n/a	233	234
1000 446	228	231	233	232	n/a	n/a	230	232
1000 447	221	225	227	227	n/a	n/a	225	225

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 448	222	222	226	226	n/a	n/a	225	226
1000 449	232	236	238	238	n/a	n/a	236	237
1000 45	493	512	524	541	n/a	n/a	513	517
1000 450	220	220	225	224	n/a	n/a	223	224
1000 451	136	136	140	139	n/a	n/a	139	139
1000 452	132	133	135	135	n/a	n/a	134	134
1000 453	138	138	141	141	n/a	n/a	140	141
1000 454	139	140	142	142	n/a	n/a	141	142
1000 455	136	137	140	139	n/a	n/a	138	139
1000 456	135	135	138	137	n/a	n/a	137	137
1000 457	137	137	140	140	n/a	n/a	139	139
1000 458	135	135	138	137	n/a	n/a	136	137
1000 459	137	138	140	140	n/a	n/a	139	140
1000 46	499	521	538	563	n/a	n/a	527	533
1000 460	138	138	141	140	n/a	n/a	140	140
1000 461	137	137	140	139	n/a	n/a	139	139
1000 462	136	136	139	139	n/a	n/a	138	138
1000 463	136	136	138	138	n/a	n/a	138	138
1000 464	138	139	141	141	n/a	n/a	140	141
1000 465	138	138	141	141	n/a	n/a	140	141
1000 466	133	133	137	136	n/a	n/a	135	136
1000 467	138	138	140	140	n/a	n/a	140	140
1000 468	137	138	140	139	n/a	n/a	138	140
1000 469	137	137	140	140	n/a	n/a	139	140
1000 47	507	528	542	553	n/a	n/a	527	532
1000 470	135	135	138	138	n/a	n/a	136	137
1000 471	135	135	138	138	n/a	n/a	137	138
1000 472	140	140	143	143	n/a	n/a	142	143
1000 473	135	135	138	138	n/a	n/a	137	137
1000 474	136	137	139	139	n/a	n/a	138	139
1000 475	136	136	139	139	n/a	n/a	138	139
1000 476	519	585	588	590	n/a	n/a	581	n/a
1000 477	526	597	594	596	n/a	n/a	586	n/a
1000 478	545	607	604	605	n/a	n/a	n/a	n/a
1000 479	513	588	590	587	n/a	n/a	577	n/a
1000 48	530	549	565	584	n/a	n/a	559	562
1000 480	508	582	578	574	n/a	n/a	568	n/a
1000 481	519	594	585	587	n/a	n/a	582	n/a
1000 482	541	604	605	610	n/a	n/a	n/a	n/a
1000 483	506	588	577	582	n/a	n/a	566	n/a
1000 484	535	598	596	598	n/a	n/a	594	n/a
1000 485	521	594	591	596	n/a	n/a	582	n/a
1000 486	510	582	583	584	n/a	n/a	574	n/a
1000 487	524	597	592	597	n/a	n/a	587	n/a
1000 488	511	581	581	582	n/a	n/a	576	n/a

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 489	502	578	577	577	n/a	n/a	568	n/a
1000 49	507	525	544	559	n/a	n/a	530	538
1000 490	514	594	587	583	n/a	n/a	576	n/a
1000 491	507	585	582	584	n/a	n/a	571	n/a
1000 492	527	606	596	604	n/a	n/a	591	n/a
1000 493	498	571	568	573	n/a	n/a	561	n/a
1000 494	514	583	580	587	n/a	n/a	575	n/a
1000 495	530	606	603	609	n/a	n/a	596	n/a
1000 496	505	569	571	572	n/a	n/a	565	n/a
1000 497	504	580	578	574	n/a	n/a	568	n/a
1000 498	523	593	594	592	n/a	n/a	587	n/a
1000 499	505	579	580	579	n/a	n/a	570	n/a
1000 5	135	135	136	136	n/a	n/a	136	136
1000 50	493	513	528	548	n/a	n/a	515	519
1000 500	512	591	586	593	n/a	n/a	575	n/a
1000 501	227	234	237	235	n/a	n/a	232	234
1000 502	224	230	232	231	n/a	n/a	230	230
1000 503	224	231	233	233	n/a	n/a	231	231
1000 504	227	234	236	235	n/a	n/a	233	235
1000 505	213	218	222	221	n/a	n/a	218	220
1000 506	223	230	230	230	n/a	n/a	229	230
1000 507	220	227	230	228	n/a	n/a	226	228
1000 508	219	225	227	226	n/a	n/a	223	225
1000 509	225	232	233	232	n/a	n/a	230	231
1000 51	226	228	231	231	n/a	n/a	228	229
1000 510	226	234	235	234	n/a	n/a	232	234
1000 511	230	237	238	239	n/a	n/a	236	238
1000 512	219	227	227	226	n/a	n/a	224	226
1000 513	219	226	228	226	n/a	n/a	225	226
1000 514	226	232	234	234	n/a	n/a	233	234
1000 515	221	227	229	229	n/a	n/a	226	227
1000 516	229	236	238	237	n/a	n/a	235	237
1000 517	221	228	229	228	n/a	n/a	227	228
1000 518	220	226	229	227	n/a	n/a	225	226
1000 519	221	226	229	229	n/a	n/a	227	232
1000 52	228	229	232	233	n/a	n/a	230	230
1000 520	226	231	235	232	n/a	n/a	231	232
1000 521	229	236	239	238	n/a	n/a	235	236
1000 522	215	221	222	222	n/a	n/a	220	222
1000 523	220	226	228	228	n/a	n/a	225	227
1000 524	225	233	233	234	n/a	n/a	232	233
1000 525	221	227	230	228	n/a	n/a	226	229
1000 53	227	229	230	231	n/a	n/a	229	229
1000 54	219	221	223	224	n/a	n/a	221	222
1000 55	217	218	220	222	n/a	n/a	219	219

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 56	228	229	232	232	n/a	n/a	230	230
1000 57	224	226	227	228	n/a	n/a	226	226
1000 58	224	225	227	227	n/a	n/a	225	226
1000 59	223	224	226	226	n/a	n/a	225	225
1000 6	141	141	143	143	n/a	n/a	142	143
1000 60	230	232	234	234	n/a	n/a	232	232
1000 61	229	231	233	234	n/a	n/a	231	232
1000 62	223	225	227	228	n/a	n/a	225	225
1000 63	227	229	230	230	n/a	n/a	228	229
1000 64	229	229	233	234	n/a	n/a	231	231
1000 65	225	226	227	229	n/a	n/a	226	227
1000 66	227	227	230	231	n/a	n/a	229	229
1000 67	223	224	227	227	n/a	n/a	224	225
1000 68	226	228	231	231	n/a	n/a	228	228
1000 69	224	224	227	227	n/a	n/a	226	226
1000 7	136	136	138	138	n/a	n/a	137	137
1000 70	228	230	231	232	n/a	n/a	230	230
1000 71	230	232	233	234	n/a	n/a	232	232
1000 72	222	223	226	226	n/a	n/a	224	224
1000 73	221	223	224	225	n/a	n/a	223	223
1000 74	227	229	231	231	n/a	n/a	229	229
1000 75	227	229	231	231	n/a	n/a	229	229
1000 76	136	136	137	137	n/a	n/a	137	n/a
1000 77	136	136	137	137	n/a	n/a	137	137
1000 78	138	138	140	140	n/a	n/a	140	n/a
1000 79	142	142	143	143	n/a	n/a	143	143
1000 8	138	138	140	140	n/a	n/a	139	139
1000 80	140	140	141	142	n/a	n/a	141	141
1000 81	136	136	138	138	n/a	n/a	137	137
1000 82	136	136	137	137	n/a	n/a	137	137
1000 83	140	140	141	141	n/a	n/a	140	141
1000 84	135	135	136	136	n/a	n/a	136	136
1000 85	136	136	138	137	n/a	n/a	137	137
1000 86	138	138	139	139	n/a	n/a	139	140
1000 87	140	140	142	142	n/a	n/a	141	n/a
1000 88	140	140	142	142	n/a	n/a	141	141
1000 89	140	140	142	142	n/a	n/a	141	141
1000 9	134	134	136	136	n/a	n/a	135	135
1000 90	138	138	139	139	n/a	n/a	138	n/a
1000 91	141	141	142	142	n/a	n/a	142	n/a
1000 92	136	136	137	137	n/a	n/a	137	n/a
1000 93	137	137	138	138	n/a	n/a	138	n/a
1000 94	137	137	139	139	n/a	n/a	138	n/a
1000 95	136	136	137	137	n/a	n/a	137	n/a
1000 96	137	137	139	139	n/a	n/a	138	138

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
1000 97	138	138	140	140	n/a	n/a	139	139
1000 98	136	136	137	137	n/a	n/a	136	n/a
1000 99	136	136	137	137	n/a	n/a	137	n/a
100 1	23	23	24	23	24	78	23	24
100 10	22	22	22	22	n/a	56	22	22
100 100	25	25	25	25	n/a	65	25	25
100 101	15	15	15	15	n/a	70	15	15
100 102	14	14	14	14	n/a	15	14	14
100 103	14	14	14	14	n/a	14	14	14
100 104	14	14	14	14	n/a	83	14	14
100 105	13	13	13	13	n/a	13	13	13
100 106	14	14	14	14	41	14	14	14
100 107	14	14	14	14	n/a	14	14	14
100 108	14	14	14	14	n/a	15	15	15
100 109	15	15	15	15	n/a	92	15	15
100 11	24	24	24	24	53	88	24	24
100 110	13	13	13	13	45	84	13	13
100 111	16	16	16	16	n/a	98	16	16
100 112	13	13	13	13	n/a	14	13	13
100 113	14	14	14	14	34	49	14	14
100 114	13	13	13	13	n/a	14	13	13
100 115	14	14	14	14	20	17	14	14
100 116	16	16	16	16	n/a	71	16	16
100 117	15	15	15	15	n/a	78	15	16
100 118	15	15	15	15	43	15	15	15
100 119	14	14	14	14	n/a	90	14	14
100 12	25	25	25	25	27	79	25	25
100 120	14	14	14	14	n/a	14	14	14
100 121	15	15	15	15	n/a	15	15	15
100 122	13	13	13	13	41	19	13	13
100 123	15	15	15	15	n/a	71	15	15
100 124	15	15	15	15	n/a	16	15	16
100 125	14	14	14	14	48	14	14	14
100 126	49	54	53	51	77	63	51	52
100 127	50	54	54	52	78	53	53	55
100 128	56	59	58	57	70	83	57	58
100 129	53	56	55	54	67	55	55	56
100 13	24	24	24	24	25	84	24	24
100 130	52	56	56	55	79	56	56	55
100 131	50	54	53	53	69	71	53	54
100 132	56	59	59	58	70	77	58	59
100 133	53	56	57	55	86	56	57	57
100 134	52	58	57	55	72	56	55	56
100 135	53	58	56	55	71	57	55	58
100 136	49	54	53	52	72	76	54	56

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		Direct			Chuffed	Alternative	
	LB	UB	CPO	CPSat	Cplex		CPO	CPSat
100 137	50	57	54	54	75	66	54	57
100 138	56	57	57	56	70	76	57	58
100 139	50	52	52	52	70	84	52	52
100 14	20	20	20	20	n/a	66	20	20
100 140	54	57	55	55	65	69	55	56
100 141	49	51	52	51	70	53	51	52
100 142	52	57	56	55	68	91	55	55
100 143	51	52	54	53	84	64	54	55
100 144	47	49	49	49	59	76	49	49
100 145	53	58	57	56	n/a	82	57	59
100 146	53	53	53	53	63	53	53	53
100 147	58	62	60	59	73	71	60	61
100 148	50	54	53	52	65	80	54	55
100 149	54	57	55	55	69	76	55	56
100 15	24	24	24	24	93	63	24	24
100 150	54	58	58	57	72	59	57	59
100 151	21	21	22	22	n/a	36	22	22
100 152	22	22	22	22	n/a	75	22	22
100 153	21	21	21	21	n/a	21	21	21
100 154	25	25	25	25	n/a	76	25	25
100 155	22	22	22	22	n/a	98	22	22
100 156	23	23	23	23	97	69	23	23
100 157	26	26	26	26	60	42	26	26
100 158	23	23	23	23	n/a	86	23	23
100 159	19	19	19	19	n/a	78	19	19
100 16	23	23	23	23	43	91	23	23
100 160	22	22	22	22	n/a	89	22	22
100 161	22	22	23	23	n/a	56	23	23
100 162	22	22	23	23	n/a	32	23	23
100 163	25	25	25	25	n/a	76	25	25
100 164	23	23	23	23	53	53	23	23
100 165	24	24	25	25	n/a	70	25	25
100 166	24	24	24	24	n/a	32	24	24
100 167	22	22	22	22	n/a	51	22	22
100 168	21	21	22	22	n/a	75	21	22
100 169	21	21	21	21	n/a	94	21	21
100 17	21	21	22	22	n/a	68	22	22
100 170	24	24	24	24	52	38	24	24
100 171	24	24	25	25	25	25	24	25
100 172	24	24	24	24	n/a	91	24	24
100 173	24	25	25	25	26	91	25	25
100 174	22	22	22	23	n/a	47	22	23
100 175	26	27	27	27	100	71	27	27
100 176	13	13	13	13	14	80	13	13
100 177	14	14	14	14	19	95	14	14

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		Direct			Chuffed	Alternative	
	LB	UB	CPO	CPSat	Cplex		CPO	CPSat
100 178	15	15	15	15	n/a	81	15	15
100 179	15	15	15	15	16	74	15	15
100 18	19	19	20	20	n/a	95	20	20
100 180	15	15	15	15	15	91	15	15
100 181	13	13	13	13	14	60	13	13
100 182	15	15	15	15	15	47	15	15
100 183	14	14	14	14	31	72	14	14
100 184	14	14	14	14	n/a	96	14	14
100 185	15	15	15	15	n/a	54	15	15
100 186	14	14	14	14	15	64	14	14
100 187	13	13	14	14	14	48	13	14
100 188	16	16	16	16	n/a	69	16	16
100 189	14	14	14	14	n/a	85	14	14
100 19	23	23	23	23	n/a	91	23	23
100 190	13	13	13	13	14	89	13	13
100 191	14	14	14	14	14	78	14	14
100 192	13	13	13	13	14	78	13	13
100 193	15	15	15	15	62	98	15	15
100 194	15	15	15	15	n/a	80	15	15
100 195	15	15	15	15	36	85	15	15
100 196	15	15	15	15	15	97	15	15
100 197	15	15	15	15	100	24	15	15
100 198	13	13	13	13	37	79	13	13
100 199	14	14	14	14	20	19	14	14
100 2	21	21	21	21	n/a	51	21	21
100 20	21	21	21	21	n/a	76	21	21
100 200	15	15	15	15	n/a	96	15	15
100 201	52	54	55	54	72	84	53	55
100 202	61	62	62	61	100	92	61	65
100 203	52	53	53	53	n/a	64	52	53
100 204	49	51	52	51	n/a	80	50	51
100 205	56	58	58	56	75	91	57	58
100 206	50	54	53	52	n/a	57	52	53
100 207	50	52	52	52	n/a	70	51	53
100 208	56	60	57	57	n/a	87	57	59
100 209	54	56	56	56	73	78	56	58
100 21	21	21	21	21	22	79	21	21
100 210	51	53	53	52	65	65	52	54
100 211	51	53	53	52	79	81	52	52
100 212	51	53	54	52	69	55	52	54
100 213	51	54	54	53	74	96	53	55
100 214	53	56	55	55	71	87	55	56
100 215	47	49	51	50	n/a	76	49	51
100 216	51	53	54	52	n/a	94	53	55
100 217	51	53	53	52	70	84	52	54

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
100 218	52	56	54	53	65	57	54	56
100 219	51	53	53	52	77	88	52	54
100 22	24	24	25	25	n/a	48	25	25
100 220	52	54	54	53	88	87	53	55
100 221	56	57	58	57	97	88	57	59
100 222	51	55	54	53	82	66	53	55
100 223	50	53	52	52	n/a	64	51	52
100 224	55	56	56	56	n/a	63	55	57
100 225	51	55	54	54	74	58	53	55
100 226	24	24	25	25	n/a	68	25	25
100 227	26	27	27	27	n/a	27	27	27
100 228	22	22	22	22	n/a	22	22	22
100 229	24	24	24	24	n/a	24	24	24
100 23	24	24	24	24	n/a	98	24	24
100 230	23	23	24	24	n/a	38	24	24
100 231	22	22	23	22	n/a	23	22	22
100 232	22	22	22	22	99	35	22	22
100 233	22	22	23	23	n/a	36	23	23
100 234	23	23	23	23	n/a	23	23	23
100 235	26	26	26	26	54	26	26	26
100 236	22	22	23	23	25	23	23	23
100 237	23	23	23	23	n/a	23	23	23
100 238	23	23	23	23	n/a	49	23	23
100 239	21	21	21	21	36	92	21	21
100 24	24	24	24	24	42	69	24	24
100 240	22	22	22	22	n/a	22	22	22
100 241	22	22	22	22	n/a	67	22	23
100 242	23	23	23	23	n/a	87	23	23
100 243	23	23	24	24	n/a	28	23	24
100 244	21	21	21	21	n/a	51	21	21
100 245	23	24	24	24	n/a	24	24	24
100 246	26	26	26	26	89	26	26	27
100 247	22	22	22	22	n/a	24	22	23
100 248	19	19	19	19	36	20	19	20
100 249	21	21	21	21	n/a	69	21	21
100 25	22	22	22	22	25	95	22	22
100 250	24	24	24	24	n/a	24	24	24
100 251	15	15	15	15	25	15	15	15
100 252	14	14	14	14	n/a	14	14	14
100 253	14	14	14	14	26	93	14	14
100 254	14	14	14	14	42	14	14	14
100 255	14	14	14	14	14	14	14	14
100 256	15	15	15	15	n/a	15	15	15
100 257	12	12	12	12	100	13	12	12
100 258	14	14	14	14	n/a	15	14	15

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
100 259	15	15	15	15	n/a	35	15	15
100 26	14	14	14	14	n/a	81	14	14
100 260	15	15	15	15	n/a	15	15	15
100 261	14	14	14	14	99	49	14	14
100 262	14	14	14	14	100	14	14	14
100 263	14	14	14	14	n/a	14	14	14
100 264	15	15	15	15	41	69	15	15
100 265	14	14	14	14	100	96	14	14
100 266	13	13	13	13	32	13	13	13
100 267	13	13	13	13	25	13	13	13
100 268	15	15	15	15	15	15	15	15
100 269	15	15	15	15	n/a	15	15	15
100 27	13	13	13	13	35	56	13	13
100 270	13	13	13	13	99	13	13	13
100 271	13	13	14	13	39	95	13	14
100 272	14	14	14	14	n/a	14	14	14
100 273	13	13	13	13	n/a	13	13	13
100 274	13	13	13	13	n/a	14	13	14
100 275	13	13	13	13	100	13	13	13
100 276	58	63	61	61	69	63	61	62
100 277	53	61	58	58	70	78	57	61
100 278	55	60	58	58	67	61	57	59
100 279	52	58	55	54	73	58	55	57
100 28	14	14	14	14	15	74	14	14
100 280	51	57	56	55	67	68	56	57
100 281	59	64	62	62	85	83	62	64
100 282	57	63	61	60	71	90	61	63
100 283	53	57	56	55	65	56	55	57
100 284	54	56	56	55	72	59	56	56
100 285	52	57	55	55	69	57	55	57
100 286	55	60	58	57	77	84	57	59
100 287	53	56	55	54	78	55	55	57
100 288	53	59	56	56	67	58	56	60
100 289	61	65	62	62	73	64	62	64
100 29	14	14	14	14	16	83	14	14
100 290	52	59	55	55	67	60	55	57
100 291	49	53	53	52	72	54	53	55
100 292	55	58	59	57	72	60	59	60
100 293	50	56	53	53	63	84	53	55
100 294	54	58	58	58	73	57	57	61
100 295	55	60	57	57	73	62	57	59
100 296	53	58	56	55	69	57	56	59
100 297	54	61	59	58	68	79	59	61
100 298	57	59	59	59	68	61	59	61
100 299	54	56	56	54	66	69	55	55

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
100 3	20	20	20	20	62	55	20	20
100 30	15	15	15	15	71	73	15	15
100 300	51	57	55	55	97	55	54	55
100 301	23	23	23	23	25	31	23	23
100 302	24	24	24	24	68	35	24	24
100 303	24	24	24	24	56	65	24	24
100 304	21	21	21	21	54	81	21	21
100 305	22	22	22	22	n/a	82	22	22
100 306	24	24	24	24	n/a	81	24	24
100 307	23	23	24	24	n/a	44	24	24
100 308	20	20	21	21	22	75	21	21
100 309	21	21	22	22	n/a	80	22	22
100 31	14	14	14	14	n/a	38	14	14
100 310	23	23	23	23	n/a	57	23	23
100 311	21	21	21	21	n/a	94	21	21
100 312	22	22	22	22	44	68	22	22
100 313	23	23	23	23	n/a	88	23	23
100 314	19	19	19	19	100	43	19	19
100 315	22	22	23	22	n/a	51	22	23
100 316	24	24	24	24	n/a	82	24	24
100 317	26	26	26	26	n/a	97	26	26
100 318	21	21	21	21	n/a	95	21	21
100 319	23	23	23	23	n/a	85	23	23
100 32	14	14	14	14	100	82	14	14
100 320	22	22	22	22	n/a	95	22	22
100 321	26	26	26	26	53	70	26	26
100 322	23	23	24	24	46	59	23	24
100 323	24	24	24	24	26	70	24	24
100 324	23	23	23	23	n/a	66	23	23
100 325	25	25	26	25	n/a	58	25	26
100 326	13	13	13	13	14	92	13	13
100 327	14	14	14	14	15	85	14	14
100 328	14	14	15	14	100	82	14	15
100 329	14	14	14	14	65	83	14	14
100 33	15	15	15	15	93	50	15	15
100 330	14	14	14	14	n/a	66	14	15
100 331	14	14	14	14	92	86	14	14
100 332	14	14	14	14	14	81	14	14
100 333	15	15	15	15	49	86	15	15
100 334	14	14	14	14	n/a	70	14	14
100 335	13	13	13	13	14	71	13	13
100 336	15	15	15	15	55	61	15	15
100 337	13	13	13	13	14	85	13	13
100 338	14	14	15	15	16	60	14	15
100 339	14	14	14	14	16	88	14	14

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
100 34	15	15	15	15	n/a	15	15	15
100 340	14	14	14	14	15	72	14	14
100 341	16	16	16	16	n/a	75	16	16
100 342	14	14	14	14	100	71	14	14
100 343	16	16	16	16	n/a	81	16	16
100 344	15	15	15	15	100	96	15	15
100 345	14	14	14	14	98	14	14	14
100 346	14	14	14	14	99	95	14	14
100 347	14	14	14	14	15	73	14	14
100 348	14	14	14	14	n/a	99	14	14
100 349	13	13	13	13	14	79	13	13
100 35	15	15	15	15	16	89	15	15
100 350	14	14	14	14	36	78	14	14
100 351	58	60	60	59	98	89	59	61
100 352	63	63	63	63	82	92	63	64
100 353	50	54	53	51	n/a	83	51	52
100 354	51	54	53	52	67	76	52	53
100 355	53	55	56	55	68	88	55	57
100 356	59	61	61	59	n/a	97	60	61
100 357	53	53	54	53	79	98	53	54
100 358	51	54	53	52	100	87	52	53
100 359	52	54	54	53	99	94	54	53
100 36	14	14	14	15	n/a	70	14	15
100 360	54	57	56	54	n/a	81	56	57
100 361	50	52	53	52	n/a	66	51	52
100 362	57	57	57	57	98	75	58	59
100 363	51	53	54	52	65	92	52	53
100 364	51	53	53	52	79	86	53	53
100 365	52	54	55	53	76	86	54	56
100 366	61	61	62	61	88	95	62	62
100 367	55	57	57	55	82	87	56	58
100 368	58	59	60	59	100	99	59	60
100 369	49	52	52	51	n/a	61	52	53
100 37	14	14	14	14	n/a	95	14	14
100 370	56	57	57	57	91	90	57	60
100 371	51	54	53	53	100	81	54	55
100 372	47	49	49	49	n/a	83	49	50
100 373	49	52	52	51	n/a	67	51	53
100 374	51	53	53	52	n/a	99	51	52
100 375	57	57	58	57	81	92	57	60
100 376	23	23	23	23	n/a	32	23	23
100 377	20	20	21	21	n/a	28	21	21
100 378	22	22	22	22	n/a	86	22	22
100 379	23	23	24	23	n/a	90	23	24
100 38	14	14	14	14	16	80	14	14

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
100 380	22	22	23	23	n/a	46	23	23
100 381	24	24	24	24	n/a	98	24	24
100 382	25	25	25	25	61	43	25	26
100 383	25	25	25	25	54	67	25	25
100 384	25	25	25	25	n/a	96	25	25
100 385	22	22	22	22	n/a	22	22	22
100 386	23	23	24	24	n/a	72	24	24
100 387	22	22	22	22	n/a	65	22	22
100 388	25	25	26	26	n/a	40	26	26
100 389	23	23	23	23	n/a	45	23	23
100 39	14	14	14	14	30	94	14	14
100 390	22	22	23	23	67	63	23	23
100 391	20	20	20	20	n/a	86	20	20
100 392	22	22	22	22	47	77	22	22
100 393	23	23	24	24	n/a	24	24	24
100 394	22	22	22	22	n/a	22	22	22
100 395	24	24	24	24	n/a	82	24	24
100 396	20	20	20	20	n/a	61	20	20
100 397	25	26	26	26	57	27	26	26
100 398	25	25	25	25	n/a	78	25	25
100 399	23	23	23	23	n/a	43	23	23
100 4	24	24	24	24	n/a	57	24	24
100 40	14	14	14	14	57	73	14	14
100 400	24	24	24	24	31	24	24	24
100 401	15	15	15	15	n/a	70	15	15
100 402	15	15	15	15	n/a	87	15	15
100 403	14	14	14	14	99	53	14	14
100 404	15	15	15	15	56	15	15	15
100 405	13	13	13	13	14	87	13	13
100 406	14	14	14	14	14	14	14	14
100 407	15	15	15	15	n/a	15	15	15
100 408	14	14	14	14	90	94	14	14
100 409	15	15	15	15	n/a	26	15	15
100 41	13	13	13	13	n/a	49	13	13
100 410	14	14	14	14	n/a	14	14	14
100 411	14	14	14	14	n/a	15	14	14
100 412	14	14	14	14	n/a	98	14	14
100 413	14	14	14	14	n/a	14	14	14
100 414	14	14	15	15	47	34	14	15
100 415	13	13	13	13	99	13	13	13
100 416	14	14	14	14	52	14	14	14
100 417	15	15	15	15	n/a	15	15	15
100 418	16	16	16	16	n/a	16	16	16
100 419	14	14	14	14	n/a	15	14	15
100 42	14	14	14	14	n/a	87	14	14

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		Direct			Chuffed	Alternative	
	LB	UB	CPO	CPSat	Cplex		CPO	CPSat
100 420	14	14	14	14	37	14	14	14
100 421	14	14	14	14	14	87	14	14
100 422	15	15	15	15	39	72	15	15
100 423	14	14	14	14	42	91	14	14
100 424	14	14	14	14	57	71	14	14
100 425	15	15	15	15	98	57	15	15
100 426	58	63	61	61	74	64	60	62
100 427	54	57	56	56	78	59	56	59
100 428	54	57	55	55	69	81	55	57
100 429	57	61	59	58	73	61	58	60
100 43	14	14	14	14	15	95	14	14
100 430	52	54	55	53	68	70	55	56
100 431	52	55	54	55	68	84	54	55
100 432	54	59	56	56	74	66	56	58
100 433	51	54	54	52	65	54	53	54
100 434	55	59	57	57	70	80	57	59
100 435	52	58	57	56	69	58	57	58
100 436	49	55	52	52	66	91	52	53
100 437	51	56	54	53	66	56	53	55
100 438	52	57	56	55	66	72	55	57
100 439	54	58	56	55	79	58	55	57
100 44	14	14	14	14	37	83	14	14
100 440	51	55	54	54	63	80	54	55
100 441	51	54	53	53	66	61	53	56
100 442	48	56	53	52	68	53	53	55
100 443	53	58	56	55	66	56	56	57
100 444	51	56	54	54	99	56	54	55
100 445	54	57	56	56	65	56	57	57
100 446	54	57	58	57	73	58	57	59
100 447	52	55	55	54	64	63	54	56
100 448	54	60	56	56	84	58	56	58
100 449	52	57	56	55	71	56	55	56
100 45	14	14	14	14	95	89	14	14
100 450	53	53	55	54	68	56	54	56
100 451	26	26	26	26	30	26	26	26
100 452	22	22	22	22	24	22	22	22
100 453	24	24	24	24	n/a	24	24	24
100 454	23	23	23	23	n/a	23	23	23
100 455	23	23	23	23	n/a	23	23	23
100 456	26	26	26	26	29	26	26	26
100 457	23	23	23	23	n/a	23	23	23
100 458	24	24	24	24	n/a	24	24	24
100 459	23	23	23	23	n/a	23	23	23
100 46	14	14	14	14	14	73	14	14
100 460	23	23	23	23	26	23	23	23

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
100 461	23	23	23	23	31	23	23	24
100 462	23	23	23	23	n/a	23	23	23
100 463	26	26	26	26	28	26	26	26
100 464	25	25	25	25	31	25	25	25
100 465	22	22	22	22	30	22	22	22
100 466	26	26	26	26	39	26	26	26
100 467	21	21	21	21	n/a	21	21	21
100 468	25	25	25	25	32	25	25	25
100 469	22	22	22	22	24	22	22	22
100 47	14	14	14	14	n/a	87	14	14
100 470	26	26	26	26	n/a	26	26	26
100 471	26	26	26	26	88	26	26	26
100 472	23	23	23	23	32	23	23	23
100 473	28	28	28	28	n/a	28	28	28
100 474	23	23	23	23	25	23	23	23
100 475	24	24	24	24	n/a	24	24	24
100 476	14	14	14	14	15	14	14	14
100 477	14	14	14	14	n/a	14	14	14
100 478	14	14	14	14	n/a	14	14	14
100 479	16	16	16	16	n/a	16	16	16
100 48	15	15	15	15	16	73	15	15
100 480	15	15	15	15	n/a	15	15	15
100 481	15	15	15	15	n/a	15	15	15
100 482	15	15	15	15	n/a	15	15	15
100 483	14	14	14	14	26	14	14	14
100 484	14	14	14	14	n/a	14	14	14
100 485	16	16	16	16	20	16	16	16
100 486	15	15	15	15	n/a	15	15	15
100 487	15	15	15	15	n/a	15	15	15
100 488	16	16	16	16	n/a	16	16	16
100 489	13	13	13	13	33	13	13	13
100 49	14	14	14	14	15	97	14	14
100 490	15	15	15	15	n/a	15	15	15
100 491	16	16	16	16	28	16	16	16
100 492	14	14	14	14	95	14	14	14
100 493	14	14	14	14	n/a	14	14	14
100 494	14	14	14	14	n/a	14	14	14
100 495	15	15	15	15	18	15	15	15
100 496	14	14	14	14	24	14	14	14
100 497	13	13	13	13	64	13	13	13
100 498	14	14	14	14	n/a	14	14	14
100 499	14	14	14	14	25	14	14	14
100 5	22	22	22	22	24	92	22	22
100 50	14	14	14	14	14	57	14	14
100 500	14	14	14	14	17	14	14	14

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
100 501	58	63	63	62	67	62	63	64
100 502	60	67	64	64	69	64	64	66
100 503	55	62	60	60	65	60	61	62
100 504	55	62	60	60	64	60	60	60
100 505	55	62	61	61	63	61	61	63
100 506	54	58	59	57	64	57	58	60
100 507	55	60	59	59	62	59	59	60
100 508	53	56	56	56	61	56	56	56
100 509	53	60	57	57	63	57	58	60
100 51	48	51	51	50	n/a	83	50	51
100 510	54	60	58	58	63	58	58	58
100 511	56	59	60	59	61	59	60	60
100 512	57	61	60	60	66	60	60	62
100 513	55	63	62	62	64	62	62	64
100 514	54	60	58	58	66	58	58	59
100 515	56	63	61	61	65	61	62	64
100 516	67	70	70	70	78	70	70	70
100 517	57	62	62	62	64	62	62	62
100 518	51	58	57	57	67	57	57	59
100 519	57	63	61	61	69	61	61	63
100 52	52	54	53	53	71	85	53	54
100 520	54	62	60	60	64	60	60	61
100 521	65	70	70	70	75	70	70	70
100 522	54	60	59	59	65	59	59	60
100 523	52	58	55	55	61	55	55	57
100 524	53	59	59	59	68	59	59	60
100 525	55	62	62	62	66	62	62	62
100 53	52	53	53	52	88	89	52	53
100 54	51	52	52	52	n/a	95	51	52
100 55	52	54	54	52	n/a	89	53	55
100 56	51	53	53	53	68	75	52	53
100 57	53	58	55	55	100	89	55	56
100 58	56	58	58	57	86	92	57	58
100 59	57	57	58	57	84	91	58	59
100 6	22	22	22	22	n/a	83	22	22
100 60	53	57	54	54	n/a	76	54	55
100 61	54	54	56	54	76	79	56	57
100 62	50	53	53	52	100	57	52	53
100 63	61	61	61	61	n/a	96	61	61
100 64	55	56	57	56	71	88	56	57
100 65	61	61	62	61	66	83	62	63
100 66	50	52	52	52	78	98	51	52
100 67	54	56	56	55	n/a	87	55	57
100 68	57	57	57	57	99	86	57	57
100 69	53	55	54	53	81	99	53	54

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
100 7	26	26	26	26	n/a	53	26	26
100 70	51	56	55	53	n/a	88	54	57
100 71	52	53	54	53	95	91	53	54
100 72	52	56	55	54	77	82	54	56
100 73	55	58	56	56	71	89	56	58
100 74	50	52	53	52	n/a	93	52	53
100 75	54	55	56	55	85	87	55	56
100 76	23	23	23	23	n/a	86	23	23
100 77	20	20	20	20	n/a	71	20	20
100 78	21	21	21	21	65	43	21	22
100 79	21	21	21	21	n/a	73	21	21
100 8	24	24	24	24	n/a	69	24	24
100 80	22	22	22	23	99	23	22	23
100 81	20	20	20	20	n/a	54	20	20
100 82	21	21	21	21	n/a	90	21	21
100 83	22	22	22	22	n/a	90	22	22
100 84	26	27	27	27	45	86	27	27
100 85	24	24	25	25	n/a	25	25	25
100 86	23	23	23	23	n/a	23	23	23
100 87	22	22	22	22	n/a	74	22	22
100 88	23	23	24	24	n/a	43	24	24
100 89	24	24	24	24	73	45	24	24
100 9	23	23	24	24	25	80	23	24
100 90	20	20	21	21	n/a	75	21	21
100 91	25	25	25	25	n/a	77	25	25
100 92	24	24	24	24	n/a	24	24	24
100 93	27	28	27	27	n/a	28	27	28
100 94	22	22	22	22	57	91	23	23
100 95	21	21	21	21	n/a	22	21	21
100 96	21	21	21	21	100	22	21	22
100 97	22	22	22	22	n/a	22	22	22
100 98	22	22	22	22	n/a	63	22	22
100 99	22	22	22	22	n/a	32	22	22
20 1	3	3	3	3	3	3	3	3
20 10	3	3	3	3	3	3	3	3
20 100	11	11	11	11	11	11	11	11
20 101	13	13	13	13	13	13	13	13
20 102	11	13	13	13	13	13	13	13
20 103	12	12	12	12	12	12	12	12
20 104	11	11	11	11	11	11	11	11
20 105	12	12	12	12	12	12	12	12
20 106	10	10	10	10	10	10	10	10
20 107	14	14	14	14	14	14	14	14
20 108	15	15	15	15	15	15	15	15
20 109	12	12	12	12	12	12	12	12

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 11	3	3	3	3	3	3	3	3
20 110	11	11	11	11	11	11	11	11
20 111	13	13	13	13	13	13	13	13
20 112	11	11	11	11	11	11	11	11
20 113	12	12	12	12	12	12	12	12
20 114	13	13	13	13	13	13	13	13
20 115	11	11	11	11	11	11	11	11
20 116	5	5	5	5	5	5	5	5
20 117	5	5	5	5	5	5	5	5
20 118	5	5	5	5	5	5	5	5
20 119	6	6	6	6	6	6	6	6
20 12	3	3	3	3	3	3	3	3
20 120	6	6	6	6	6	6	6	6
20 121	5	5	5	5	5	5	5	5
20 122	6	6	6	6	6	6	6	6
20 123	5	5	5	5	5	5	5	5
20 124	5	5	5	5	5	5	5	5
20 125	5	5	5	5	5	5	5	5
20 126	5	5	5	5	5	5	5	5
20 127	4	4	4	4	4	4	4	4
20 128	5	5	5	5	5	5	5	5
20 129	5	5	5	5	5	5	5	5
20 13	3	3	3	3	3	3	3	3
20 130	6	6	6	6	6	6	6	6
20 131	7	7	7	7	7	7	7	7
20 132	4	4	4	4	4	4	4	4
20 133	5	5	5	5	5	5	5	5
20 134	6	6	6	6	6	6	6	6
20 135	6	6	6	6	6	6	6	6
20 136	6	6	6	6	6	6	6	6
20 137	5	5	5	5	5	5	5	5
20 138	5	5	5	5	5	5	5	5
20 139	5	5	5	5	5	5	5	5
20 14	3	3	3	3	3	3	3	3
20 140	5	5	5	5	5	5	5	5
20 141	3	3	3	3	3	3	3	3
20 142	3	3	3	3	3	3	3	3
20 143	3	3	3	3	3	3	3	3
20 144	4	4	4	4	4	4	4	4
20 145	3	3	3	3	3	3	3	3
20 146	3	3	3	3	3	3	3	3
20 147	3	3	3	3	3	3	3	3
20 148	3	3	3	3	3	3	3	3
20 149	3	3	3	3	3	3	3	3
20 15	3	3	3	3	3	3	3	3

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 150	3	3	3	3	3	3	3	3
20 151	3	3	3	3	3	3	3	3
20 152	3	3	3	3	3	3	3	3
20 153	3	3	3	3	3	3	3	3
20 154	3	3	3	3	3	3	3	3
20 155	3	3	3	3	3	3	3	3
20 156	3	3	3	3	3	3	3	3
20 157	3	3	3	3	3	3	3	3
20 158	3	3	3	3	3	3	3	3
20 159	3	3	3	3	3	3	3	3
20 16	12	12	12	12	12	12	12	12
20 160	3	3	3	3	3	3	3	3
20 161	3	3	3	3	3	3	3	3
20 162	3	3	3	3	3	3	3	3
20 163	3	3	3	3	3	3	3	3
20 164	4	4	4	4	4	4	4	4
20 165	3	3	3	3	3	3	3	3
20 166	12	12	12	12	12	12	12	12
20 167	11	11	11	11	11	11	11	11
20 168	10	10	10	10	10	10	10	10
20 169	11	11	11	11	11	11	11	11
20 17	10	10	10	10	10	10	10	10
20 170	11	11	11	11	11	11	11	11
20 171	13	13	13	13	13	13	13	13
20 172	11	11	11	11	11	11	11	11
20 173	11	11	11	11	11	11	11	11
20 174	12	12	12	12	12	12	12	12
20 175	10	10	10	10	10	10	10	10
20 176	11	11	11	11	11	11	11	11
20 177	10	10	10	10	10	10	10	10
20 178	11	11	11	11	11	11	11	11
20 179	11	11	11	11	11	11	11	11
20 18	11	11	11	11	11	11	11	11
20 180	13	13	13	13	13	13	13	13
20 181	11	11	11	11	11	11	11	11
20 182	11	11	11	11	11	11	11	11
20 183	13	13	13	13	13	13	13	13
20 184	12	12	12	12	12	12	12	12
20 185	15	15	15	15	15	15	15	15
20 186	14	14	14	14	14	14	14	14
20 187	10	10	10	10	10	10	10	10
20 188	11	11	11	11	11	11	11	11
20 189	13	13	13	13	13	13	13	13
20 19	14	14	14	14	14	14	14	14
20 190	15	15	15	15	15	15	15	15

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
20 191	4	4	4	4	4	4	4	4
20 192	5	5	5	5	5	5	5	5
20 193	5	5	5	5	5	5	5	5
20 194	6	6	6	6	6	6	6	6
20 195	6	6	6	6	6	6	6	6
20 196	5	5	5	5	5	5	5	5
20 197	4	4	4	4	4	4	4	4
20 198	6	6	6	6	6	6	6	6
20 199	5	5	5	5	5	5	5	5
20 2	3	3	3	3	3	3	3	3
20 20	11	11	11	11	11	11	11	11
20 200	6	6	6	6	6	6	6	6
20 201	6	6	6	6	6	6	6	6
20 202	4	4	4	4	4	4	4	4
20 203	4	4	4	4	4	4	4	4
20 204	5	5	5	5	5	5	5	5
20 205	6	6	6	6	6	6	6	6
20 206	5	5	5	5	5	5	5	5
20 207	6	6	6	6	6	6	6	6
20 208	5	5	5	5	5	5	5	5
20 209	4	4	4	4	4	4	4	4
20 21	14	14	14	14	14	14	14	14
20 210	5	5	5	5	5	5	5	5
20 211	5	5	5	5	5	5	5	5
20 212	5	5	5	5	5	5	5	5
20 213	5	5	5	5	5	5	5	5
20 214	5	5	5	5	5	5	5	5
20 215	5	5	5	5	5	5	5	5
20 216	3	3	3	3	3	3	3	3
20 217	4	4	4	4	4	4	4	4
20 218	3	3	3	3	3	3	3	3
20 219	3	3	3	3	3	3	3	3
20 22	12	12	12	12	12	12	12	12
20 220	3	3	3	3	3	3	3	3
20 221	3	3	3	3	3	3	3	3
20 222	3	3	3	3	3	3	3	3
20 223	3	3	3	3	3	3	3	3
20 224	3	3	3	3	3	3	3	3
20 225	3	3	3	3	3	3	3	3
20 226	3	3	3	3	3	3	3	3
20 227	3	3	3	3	3	3	3	3
20 228	2	2	2	2	2	2	2	2
20 229	3	3	3	3	3	3	3	3
20 23	13	13	13	13	13	13	13	13
20 230	3	3	3	3	3	3	3	3

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 231	3	3	3	3	3	3	3	3
20 232	3	3	3	3	3	3	3	3
20 233	3	3	3	3	3	3	3	3
20 234	3	3	3	3	3	3	3	3
20 235	3	3	3	3	3	3	3	3
20 236	3	3	3	3	3	3	3	3
20 237	3	3	3	3	3	3	3	3
20 238	3	3	3	3	3	3	3	3
20 239	3	3	3	3	3	3	3	3
20 24	11	11	11	11	11	11	11	11
20 240	3	3	3	3	3	3	3	3
20 241	13	13	13	13	13	13	13	13
20 242	12	12	12	12	12	12	12	12
20 243	10	10	10	10	10	10	10	10
20 244	11	11	11	11	11	11	11	11
20 245	13	13	13	13	13	13	13	13
20 246	13	13	13	13	13	13	13	13
20 247	11	11	11	11	11	11	11	11
20 248	11	11	11	11	11	11	11	11
20 249	13	13	13	13	13	13	13	13
20 25	11	11	11	11	11	11	11	11
20 250	10	10	10	10	10	10	10	10
20 251	12	12	12	12	12	12	12	12
20 252	11	11	11	11	11	11	11	11
20 253	11	13	13	13	13	13	13	13
20 254	12	12	12	12	12	12	12	12
20 255	13	13	13	13	13	13	13	13
20 256	14	14	14	14	14	14	14	14
20 257	10	10	10	10	10	10	10	10
20 258	13	13	13	13	13	13	13	13
20 259	13	13	13	13	13	13	13	13
20 26	12	12	12	12	12	12	12	12
20 260	12	12	12	12	12	12	12	12
20 261	12	12	12	12	12	12	12	12
20 262	11	11	11	11	11	11	11	11
20 263	12	12	12	12	12	12	12	12
20 264	12	12	12	12	12	12	12	12
20 265	12	12	12	12	12	12	12	12
20 266	5	5	5	5	5	5	5	5
20 267	6	6	6	6	6	6	6	6
20 268	6	6	6	6	6	6	6	6
20 269	7	7	7	7	7	7	7	7
20 27	13	13	13	13	13	13	13	13
20 270	7	7	7	7	7	7	7	7
20 271	6	6	6	6	6	6	6	6

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
20 272	5	5	5	5	5	5	5	5
20 273	5	5	5	5	5	5	5	5
20 274	6	6	6	6	6	6	6	6
20 275	5	5	5	5	5	5	5	5
20 276	4	4	4	4	4	4	4	4
20 277	4	4	4	4	4	4	4	4
20 278	6	6	6	6	6	6	6	6
20 279	6	6	6	6	6	6	6	6
20 28	12	12	12	12	12	12	12	12
20 280	5	5	5	5	5	5	5	5
20 281	4	4	4	4	4	4	4	4
20 282	4	4	4	4	4	4	4	4
20 283	5	5	5	5	5	5	5	5
20 284	5	5	5	5	5	5	5	5
20 285	5	5	5	5	5	5	5	5
20 286	5	5	5	5	5	5	5	5
20 287	5	5	5	5	5	5	5	5
20 288	6	6	6	6	6	6	6	6
20 289	5	5	5	5	5	5	5	5
20 29	10	10	10	10	10	10	10	10
20 290	5	5	5	5	5	5	5	5
20 291	3	3	3	3	3	3	3	3
20 292	3	3	3	3	3	3	3	3
20 293	3	3	3	3	3	3	3	3
20 294	3	3	3	3	3	3	3	3
20 295	3	3	3	3	3	3	3	3
20 296	3	3	3	3	3	3	3	3
20 297	3	3	3	3	3	3	3	3
20 298	3	3	3	3	3	3	3	3
20 299	3	3	3	3	3	3	3	3
20 3	3	3	3	3	3	3	3	3
20 30	16	16	16	16	16	16	16	16
20 300	4	4	4	4	4	4	4	4
20 301	3	3	3	3	3	3	3	3
20 302	3	3	3	3	3	3	3	3
20 303	3	3	3	3	3	3	3	3
20 304	3	3	3	3	3	3	3	3
20 305	3	3	3	3	3	3	3	3
20 306	3	3	3	3	3	3	3	3
20 307	3	3	3	3	3	3	3	3
20 308	3	3	3	3	3	3	3	3
20 309	3	3	3	3	3	3	3	3
20 31	12	12	12	12	12	12	12	12
20 310	3	3	3	3	3	3	3	3
20 311	3	3	3	3	3	3	3	3

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 312	4	4	4	4	4	4	4	4
20 313	3	3	3	3	3	3	3	3
20 314	3	3	3	3	3	3	3	3
20 315	3	3	3	3	3	3	3	3
20 316	10	10	10	10	10	10	10	10
20 317	10	10	10	10	10	10	10	10
20 318	10	10	10	10	10	10	10	10
20 319	14	14	14	14	14	14	14	14
20 32	13	13	13	13	13	13	13	13
20 320	12	12	12	12	12	12	12	12
20 321	14	14	14	14	14	14	14	14
20 322	12	12	12	12	12	12	12	12
20 323	13	13	13	13	13	13	13	13
20 324	9	9	9	9	9	9	9	9
20 325	14	14	14	14	14	14	14	14
20 326	14	14	14	14	14	14	14	14
20 327	13	13	13	13	13	13	13	13
20 328	13	13	13	13	13	13	13	13
20 329	10	10	10	10	10	10	10	10
20 33	11	11	11	11	11	11	11	11
20 330	12	12	12	12	12	12	12	12
20 331	13	13	13	13	13	13	13	13
20 332	13	13	13	13	13	13	13	13
20 333	11	11	11	11	11	11	11	11
20 334	10	10	10	10	10	10	10	10
20 335	14	14	14	14	14	14	14	14
20 336	11	11	11	11	11	11	11	11
20 337	10	10	10	10	10	10	10	10
20 338	14	14	14	14	14	14	14	14
20 339	13	13	13	13	13	13	13	13
20 34	12	12	12	12	12	12	12	12
20 340	11	11	11	11	11	11	11	11
20 341	6	6	6	6	6	6	6	6
20 342	6	6	6	6	6	6	6	6
20 343	6	6	6	6	6	6	6	6
20 344	6	6	6	6	6	6	6	6
20 345	4	4	4	4	4	4	4	4
20 346	5	5	5	5	5	5	5	5
20 347	6	6	6	6	6	6	6	6
20 348	5	5	5	5	5	5	5	5
20 349	5	5	5	5	5	5	5	5
20 35	12	12	12	12	12	12	12	12
20 350	5	5	5	5	5	5	5	5
20 351	5	5	5	5	5	5	5	5
20 352	4	4	4	4	4	4	4	4

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 353	6	6	6	6	6	6	6	6
20 354	6	6	6	6	6	6	6	6
20 355	5	5	5	5	5	5	5	5
20 356	5	5	5	5	5	5	5	5
20 357	5	5	5	5	5	5	5	5
20 358	4	4	4	4	4	4	4	4
20 359	4	4	4	4	4	4	4	4
20 36	13	13	13	13	13	13	13	13
20 360	6	6	6	6	6	6	6	6
20 361	5	5	5	5	5	5	5	5
20 362	5	5	5	5	5	5	5	5
20 363	7	7	7	7	7	7	7	7
20 364	4	4	4	4	4	4	4	4
20 365	5	5	5	5	5	5	5	5
20 366	3	3	3	3	3	3	3	3
20 367	3	3	3	3	3	3	3	3
20 368	3	3	3	3	3	3	3	3
20 369	3	3	3	3	3	3	3	3
20 37	12	12	12	12	12	12	12	12
20 370	3	3	3	3	3	3	3	3
20 371	3	3	3	3	3	3	3	3
20 372	3	3	3	3	3	3	3	3
20 373	3	3	3	3	3	3	3	3
20 374	3	3	3	3	3	3	3	3
20 375	3	3	3	3	3	3	3	3
20 376	3	3	3	3	3	3	3	3
20 377	3	3	3	3	3	3	3	3
20 378	3	3	3	3	3	3	3	3
20 379	4	4	4	4	4	4	4	4
20 38	12	12	12	12	12	12	12	12
20 380	3	3	3	3	3	3	3	3
20 381	3	3	3	3	3	3	3	3
20 382	4	4	4	4	4	4	4	4
20 383	3	3	3	3	3	3	3	3
20 384	3	3	3	3	3	3	3	3
20 385	3	3	3	3	3	3	3	3
20 386	3	3	3	3	3	3	3	3
20 387	3	3	3	3	3	3	3	3
20 388	3	3	3	3	3	3	3	3
20 389	3	3	3	3	3	3	3	3
20 39	13	13	13	13	13	13	13	13
20 390	3	3	3	3	3	3	3	3
20 391	11	11	11	11	11	11	11	11
20 392	14	14	14	14	14	14	14	14
20 393	11	11	11	11	11	11	11	11

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 394	12	12	12	12	12	12	12	12
20 395	12	12	12	12	12	12	12	12
20 396	13	13	13	13	13	13	13	13
20 397	10	10	10	10	10	10	10	10
20 398	11	11	11	11	11	11	11	11
20 399	13	13	13	13	13	13	13	13
20 4	3	3	3	3	3	3	3	3
20 40	12	12	12	12	12	12	12	12
20 400	12	12	12	12	12	12	12	12
20 401	12	12	12	12	12	12	12	12
20 402	12	12	12	12	12	12	12	12
20 403	12	12	12	12	12	12	12	12
20 404	10	10	10	10	10	10	10	10
20 405	12	12	12	12	12	12	12	12
20 406	14	14	14	14	14	14	14	14
20 407	10	10	10	10	10	10	10	10
20 408	14	14	14	14	14	14	14	14
20 409	12	12	12	12	12	12	12	12
20 41	6	6	6	6	6	6	6	6
20 410	11	11	11	11	11	11	11	11
20 411	15	15	15	15	15	15	15	15
20 412	11	11	11	11	11	11	11	11
20 413	10	10	10	10	10	10	10	10
20 414	12	12	12	12	12	12	12	12
20 415	10	10	10	10	10	10	10	10
20 416	6	6	6	6	6	6	6	6
20 417	5	5	5	5	5	5	5	5
20 418	6	6	6	6	6	6	6	6
20 419	4	4	4	4	4	4	4	4
20 42	5	5	5	5	5	5	5	5
20 420	5	5	5	5	5	5	5	5
20 421	6	6	6	6	6	6	6	6
20 422	4	4	4	4	4	4	4	4
20 423	6	6	6	6	6	6	6	6
20 424	5	5	5	5	5	5	5	5
20 425	6	6	6	6	6	6	6	6
20 426	5	5	5	5	5	5	5	5
20 427	6	6	6	6	6	6	6	6
20 428	5	5	5	5	5	5	5	5
20 429	4	4	4	4	4	4	4	4
20 43	5	5	5	5	5	5	5	5
20 430	5	5	5	5	5	5	5	5
20 431	6	6	6	6	6	6	6	6
20 432	5	5	5	5	5	5	5	5
20 433	5	5	5	5	5	5	5	5

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 434	5	5	5	5	5	5	5	5
20 435	7	7	7	7	7	7	7	7
20 436	5	5	5	5	5	5	5	5
20 437	5	5	5	5	5	5	5	5
20 438	6	6	6	6	6	6	6	6
20 439	5	5	5	5	5	5	5	5
20 44	5	5	5	5	5	5	5	5
20 440	5	5	5	5	5	5	5	5
20 441	3	3	3	3	3	3	3	3
20 442	3	3	3	3	3	3	3	3
20 443	3	3	3	3	3	3	3	3
20 444	3	3	3	3	3	3	3	3
20 445	3	3	3	3	3	3	3	3
20 446	3	3	3	3	3	3	3	3
20 447	3	3	3	3	3	3	3	3
20 448	3	3	3	3	3	3	3	3
20 449	3	3	3	3	3	3	3	3
20 45	6	6	6	6	6	6	6	6
20 450	3	3	3	3	3	3	3	3
20 451	3	3	3	3	3	3	3	3
20 452	3	3	3	3	3	3	3	3
20 453	3	3	3	3	3	3	3	3
20 454	3	3	3	3	3	3	3	3
20 455	3	3	3	3	3	3	3	3
20 456	4	4	4	4	4	4	4	4
20 457	3	3	3	3	3	3	3	3
20 458	3	3	3	3	3	3	3	3
20 459	3	3	3	3	3	3	3	3
20 46	4	4	4	4	4	4	4	4
20 460	3	3	3	3	3	3	3	3
20 461	3	3	3	3	3	3	3	3
20 462	3	3	3	3	3	3	3	3
20 463	3	3	3	3	3	3	3	3
20 464	3	3	3	3	3	3	3	3
20 465	3	3	3	3	3	3	3	3
20 466	13	13	13	13	13	13	13	13
20 467	12	14	14	14	14	14	14	14
20 468	13	13	13	13	13	13	13	13
20 469	14	14	14	14	14	14	14	14
20 47	4	4	4	4	4	4	4	4
20 470	12	12	12	12	12	12	12	12
20 471	12	12	12	12	12	12	12	12
20 472	13	13	13	13	13	13	13	13
20 473	10	10	10	10	10	10	10	10
20 474	14	14	14	14	14	14	14	14

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 475	11	11	11	11	11	11	11	11
20 476	11	11	11	11	11	11	11	11
20 477	11	11	11	11	11	11	11	11
20 478	12	12	12	12	12	12	12	12
20 479	13	13	13	13	13	13	13	13
20 48	5	5	5	5	5	5	5	5
20 480	13	13	13	13	13	13	13	13
20 481	13	13	13	13	13	13	13	13
20 482	13	13	13	13	13	13	13	13
20 483	12	12	12	12	12	12	12	12
20 484	13	13	13	13	13	13	13	13
20 485	15	15	15	15	15	15	15	15
20 486	11	11	11	11	11	11	11	11
20 487	12	12	12	12	12	12	12	12
20 488	15	15	15	15	15	15	15	15
20 489	12	12	12	12	12	12	12	12
20 49	4	4	4	4	4	4	4	4
20 490	12	12	12	12	12	12	12	12
20 491	6	6	6	6	6	6	6	6
20 492	5	5	5	5	5	5	5	5
20 493	5	5	5	5	5	5	5	5
20 494	6	6	6	6	6	6	6	6
20 495	6	6	6	6	6	6	6	6
20 496	5	5	5	5	5	5	5	5
20 497	6	6	6	6	6	6	6	6
20 498	6	6	6	6	6	6	6	6
20 499	5	5	5	5	5	5	5	5
20 5	3	3	3	3	3	3	3	3
20 50	4	4	4	4	4	4	4	4
20 500	8	8	8	8	8	8	8	8
20 501	5	5	5	5	5	5	5	5
20 502	4	4	4	4	4	4	4	4
20 503	6	6	6	6	6	6	6	6
20 504	6	6	6	6	6	6	6	6
20 505	6	6	6	6	6	6	6	6
20 506	5	5	5	5	5	5	5	5
20 507	5	5	5	5	5	5	5	5
20 508	5	5	5	5	5	5	5	5
20 509	4	4	4	4	4	4	4	4
20 51	4	4	4	4	4	4	4	4
20 510	5	5	5	5	5	5	5	5
20 511	5	5	5	5	5	5	5	5
20 512	5	5	5	5	5	5	5	5
20 513	5	5	5	5	5	5	5	5
20 514	5	5	5	5	5	5	5	5

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
20 515	6	6	6	6	6	6	6	6
20 516	3	3	3	3	3	3	3	3
20 517	3	3	3	3	3	3	3	3
20 518	3	3	3	3	3	3	3	3
20 519	3	3	3	3	3	3	3	3
20 52	4	4	4	4	4	4	4	4
20 520	3	3	3	3	3	3	3	3
20 521	3	3	3	3	3	3	3	3
20 522	3	3	3	3	3	3	3	3
20 523	3	3	3	3	3	3	3	3
20 524	3	3	3	3	3	3	3	3
20 525	3	3	3	3	3	3	3	3
20 53	5	5	5	5	5	5	5	5
20 54	5	5	5	5	5	5	5	5
20 55	5	5	5	5	5	5	5	5
20 56	4	4	4	4	4	4	4	4
20 57	4	4	4	4	4	4	4	4
20 58	5	5	5	5	5	5	5	5
20 59	4	4	4	4	4	4	4	4
20 6	3	3	3	3	3	3	3	3
20 60	6	6	6	6	6	6	6	6
20 61	7	7	7	7	7	7	7	7
20 62	5	5	5	5	5	5	5	5
20 63	5	5	5	5	5	5	5	5
20 64	5	5	5	5	5	5	5	5
20 65	5	5	5	5	5	5	5	5
20 66	3	3	3	3	3	3	3	3
20 67	3	3	3	3	3	3	3	3
20 68	3	3	3	3	3	3	3	3
20 69	2	2	2	2	2	2	2	2
20 7	3	3	3	3	3	3	3	3
20 70	3	3	3	3	3	3	3	3
20 71	3	3	3	3	3	3	3	3
20 72	3	3	3	3	3	3	3	3
20 73	2	2	2	2	2	2	2	2
20 74	3	3	3	3	3	3	3	3
20 75	3	3	3	3	3	3	3	3
20 76	3	3	3	3	3	3	3	3
20 77	3	3	3	3	3	3	3	3
20 78	3	3	3	3	3	3	3	3
20 79	3	3	3	3	3	3	3	3
20 8	3	3	3	3	3	3	3	3
20 80	3	3	3	3	3	3	3	3
20 81	3	3	3	3	3	3	3	3
20 82	4	4	4	4	4	4	4	4

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
20 83	3	3	3	3	3	3	3	3
20 84	3	3	3	3	3	3	3	3
20 85	3	3	3	3	3	3	3	3
20 86	3	3	3	3	3	3	3	3
20 87	3	3	3	3	3	3	3	3
20 88	3	3	3	3	3	3	3	3
20 89	3	3	3	3	3	3	3	3
20 9	3	3	3	3	3	3	3	3
20 90	3	3	3	3	3	3	3	3
20 91	11	11	11	11	11	11	11	11
20 92	11	11	11	11	11	11	11	11
20 93	13	13	13	13	13	13	13	13
20 94	10	10	10	10	10	10	10	10
20 95	12	12	12	12	12	12	12	12
20 96	10	10	10	10	10	10	10	10
20 97	13	15	15	15	15	15	15	15
20 98	13	13	13	13	13	13	13	13
20 99	12	12	12	12	12	12	12	12
50 1	8	8	8	8	8	8	8	8
50 10	7	7	7	7	7	7	7	7
50 100	7	7	7	7	7	7	7	7
50 101	29	30	30	30	33	30	30	30
50 102	30	32	32	32	34	32	32	33
50 103	29	29	29	29	30	29	29	29
50 104	25	28	27	27	29	27	27	28
50 105	23	25	24	24	27	24	24	24
50 106	27	28	28	28	29	28	28	28
50 107	28	28	28	28	31	28	28	28
50 108	30	30	30	30	33	30	30	31
50 109	30	30	30	30	31	30	30	30
50 11	7	7	7	7	7	7	7	7
50 110	26	27	26	26	28	27	26	26
50 111	28	29	28	28	29	28	28	28
50 112	27	27	27	27	29	27	27	27
50 113	28	28	28	28	31	28	28	28
50 114	27	27	27	27	30	27	27	28
50 115	26	28	28	28	31	29	28	29
50 116	31	33	32	32	34	32	32	32
50 117	26	27	27	27	27	27	27	27
50 118	29	29	29	29	32	29	29	29
50 119	25	25	25	25	27	25	25	25
50 12	6	6	6	6	7	7	6	6
50 120	27	27	27	27	29	27	27	28
50 121	31	32	32	32	32	32	32	32
50 122	28	30	29	29	32	29	29	30

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 123	32	32	32	32	33	32	32	32
50 124	29	30	29	29	31	29	29	30
50 125	32	33	33	33	34	33	33	33
50 126	12	12	12	12	12	12	12	12
50 127	14	14	14	14	14	14	14	14
50 128	12	12	12	12	13	12	12	12
50 129	13	13	13	13	13	13	13	13
50 13	6	6	6	6	6	6	6	6
50 130	13	13	13	13	13	13	13	13
50 131	12	12	12	12	12	12	12	12
50 132	12	12	12	12	13	12	12	12
50 133	12	12	12	12	12	12	12	12
50 134	14	14	14	14	15	14	14	14
50 135	13	13	13	13	14	13	13	13
50 136	11	11	11	11	11	11	11	11
50 137	11	11	11	11	11	11	11	11
50 138	12	12	12	12	12	12	12	12
50 139	11	11	11	11	12	11	11	12
50 14	7	7	7	7	7	7	7	7
50 140	12	12	12	12	12	12	12	12
50 141	13	13	13	13	13	13	13	13
50 142	11	11	11	11	11	11	11	11
50 143	12	12	12	12	12	12	12	12
50 144	13	13	13	13	13	13	13	13
50 145	10	10	10	10	10	10	10	10
50 146	13	13	13	13	13	13	13	13
50 147	13	13	13	13	13	13	13	13
50 148	10	10	10	10	10	10	10	10
50 149	12	12	12	12	12	12	12	12
50 15	8	8	8	8	8	8	8	8
50 150	11	11	11	11	11	11	11	11
50 151	7	7	7	7	7	7	7	7
50 152	7	7	7	7	7	7	7	7
50 153	7	7	7	7	8	8	7	7
50 154	8	8	8	8	8	8	8	8
50 155	7	7	7	7	7	7	7	7
50 156	7	7	7	7	7	7	7	7
50 157	8	8	8	8	8	8	8	8
50 158	7	7	7	7	7	46	7	7
50 159	7	7	7	7	7	7	7	7
50 16	8	8	8	8	8	8	8	8
50 160	8	8	8	8	8	8	8	8
50 161	7	7	7	7	7	7	7	7
50 162	8	8	8	8	8	8	8	8
50 163	7	7	7	7	7	7	7	7

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
50 164	7	7	7	7	7	7	7	7
50 165	8	8	8	8	8	8	8	8
50 166	8	8	8	8	8	8	8	8
50 167	7	7	7	7	8	8	7	7
50 168	8	8	8	8	9	8	8	8
50 169	8	8	8	8	8	8	8	8
50 17	7	7	7	7	7	7	7	7
50 170	7	7	7	7	8	7	7	7
50 171	8	8	8	8	8	8	8	8
50 172	7	7	7	7	7	7	7	7
50 173	7	7	7	7	8	8	7	7
50 174	7	7	7	7	7	7	7	7
50 175	7	7	7	7	8	7	7	7
50 176	27	27	27	27	33	28	27	27
50 177	27	28	28	28	33	28	28	28
50 178	27	28	28	28	32	28	28	28
50 179	26	26	27	26	32	28	27	27
50 18	7	7	7	7	7	7	7	7
50 180	26	26	26	26	30	26	26	26
50 181	29	29	29	29	33	31	30	30
50 182	26	27	27	27	30	27	26	27
50 183	28	28	29	28	33	28	29	29
50 184	38	38	38	38	39	40	38	38
50 185	26	26	27	26	32	26	27	27
50 186	26	26	26	26	32	27	26	27
50 187	25	27	26	26	31	26	26	26
50 188	24	25	25	25	27	25	25	25
50 189	26	26	26	26	31	28	26	26
50 19	8	8	8	8	8	8	8	8
50 190	30	30	30	30	34	31	30	30
50 191	27	28	28	27	33	30	28	28
50 192	27	28	27	27	31	28	27	28
50 193	28	28	28	28	35	29	28	29
50 194	28	29	28	28	32	39	28	28
50 195	28	28	28	28	33	28	28	29
50 196	27	27	27	27	33	28	27	28
50 197	28	29	28	28	32	29	28	29
50 198	28	28	28	28	32	28	28	28
50 199	29	29	29	29	34	29	29	29
50 2	6	6	6	6	6	6	6	6
50 20	8	8	8	8	8	8	8	8
50 200	24	26	25	25	30	37	25	25
50 201	13	13	13	13	13	13	13	13
50 202	9	9	9	9	10	9	9	9
50 203	11	11	11	11	12	11	11	11

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
50 204	10	10	10	10	11	11	10	10
50 205	13	13	13	13	13	13	13	13
50 206	11	11	11	12	13	12	11	12
50 207	10	10	10	10	10	10	10	10
50 208	13	13	13	13	14	50	13	13
50 209	11	11	11	11	11	11	11	11
50 21	6	6	6	6	6	6	6	6
50 210	13	13	13	13	14	13	13	13
50 211	12	12	12	12	12	12	12	12
50 212	10	10	10	10	11	10	10	10
50 213	13	13	13	13	14	13	13	13
50 214	11	11	11	11	11	11	11	11
50 215	11	11	11	11	11	11	11	11
50 216	12	12	12	12	13	12	12	12
50 217	13	13	13	13	14	13	13	13
50 218	12	12	12	12	13	12	12	12
50 219	11	11	11	11	11	11	11	11
50 22	7	7	7	7	7	44	7	7
50 220	11	11	11	11	12	11	11	11
50 221	11	11	11	11	12	11	11	11
50 222	14	14	14	14	16	14	14	14
50 223	11	11	11	11	12	11	11	11
50 224	11	11	11	11	11	11	11	11
50 225	12	12	12	12	12	12	12	12
50 226	7	7	7	7	7	7	7	7
50 227	6	6	6	6	6	6	6	6
50 228	6	6	6	6	6	6	6	6
50 229	6	6	6	6	6	6	6	6
50 23	7	7	7	7	7	7	7	7
50 230	7	7	7	7	7	7	7	7
50 231	7	7	7	7	7	7	7	7
50 232	7	7	7	7	8	7	7	7
50 233	6	6	6	6	6	6	6	6
50 234	8	8	8	8	8	8	8	8
50 235	7	7	7	7	7	7	7	7
50 236	7	7	7	7	8	7	7	7
50 237	8	8	8	8	8	8	8	8
50 238	7	7	7	7	7	7	7	7
50 239	7	7	7	7	7	7	7	7
50 24	7	7	7	7	7	7	7	7
50 240	7	7	7	7	7	7	7	7
50 241	7	7	7	7	7	7	7	7
50 242	8	8	8	8	8	8	8	8
50 243	7	7	7	7	7	7	7	7
50 244	7	7	7	7	7	7	7	7

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 245	7	7	7	7	7	7	7	7
50 246	8	8	8	8	8	8	8	8
50 247	7	7	7	7	7	7	7	7
50 248	7	7	7	7	7	7	7	7
50 249	7	7	7	7	7	7	7	7
50 25	6	6	6	6	6	6	6	6
50 250	7	7	7	7	7	7	7	7
50 251	26	28	27	27	29	27	27	27
50 252	31	33	32	32	35	32	32	32
50 253	27	29	28	28	31	28	28	29
50 254	30	30	30	30	33	30	30	30
50 255	27	31	29	29	32	29	29	30
50 256	30	30	30	30	32	30	30	31
50 257	31	33	33	33	35	33	33	33
50 258	26	28	28	28	30	28	28	28
50 259	29	31	31	31	32	31	31	31
50 26	27	27	27	27	30	27	27	27
50 260	28	29	29	29	30	29	29	29
50 261	25	28	28	28	30	28	28	28
50 262	30	31	31	31	31	31	31	31
50 263	28	31	29	29	31	29	30	30
50 264	27	27	27	27	31	27	27	28
50 265	27	27	27	27	30	27	27	27
50 266	29	29	29	29	31	29	29	29
50 267	27	29	28	28	30	28	28	29
50 268	28	29	29	29	31	29	29	29
50 269	26	26	26	26	29	26	26	27
50 27	30	30	30	30	35	30	30	30
50 270	28	28	28	28	29	28	28	28
50 271	28	31	31	31	33	31	31	32
50 272	27	27	27	27	30	27	27	27
50 273	25	28	27	27	30	27	27	28
50 274	29	30	29	29	32	29	29	30
50 275	27	27	27	27	29	27	27	28
50 276	12	12	12	12	13	12	12	12
50 277	13	13	13	13	13	13	13	13
50 278	12	12	12	12	13	12	12	12
50 279	11	11	11	11	11	11	11	11
50 28	28	29	28	28	34	28	28	28
50 280	13	13	13	13	13	13	13	13
50 281	11	11	11	11	11	11	11	11
50 282	12	12	12	12	12	12	12	12
50 283	12	12	12	12	13	12	12	12
50 284	11	11	11	11	11	11	11	11
50 285	13	13	13	13	14	13	13	13

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 286	11	11	11	11	12	11	11	11
50 287	12	12	12	12	13	12	12	12
50 288	10	10	10	10	11	10	10	10
50 289	11	11	11	11	12	11	11	11
50 29	29	29	29	29	32	29	29	29
50 290	14	14	14	14	14	14	14	14
50 291	12	12	12	12	12	12	12	12
50 292	13	13	13	13	13	13	13	13
50 293	12	12	12	12	12	12	12	12
50 294	13	13	13	13	13	13	13	13
50 295	16	16	16	16	17	16	16	16
50 296	13	13	13	13	13	13	13	13
50 297	13	13	13	13	13	13	13	13
50 298	11	11	11	11	11	11	11	11
50 299	12	12	12	12	12	12	12	12
50 3	8	8	8	8	8	8	8	8
50 30	26	28	27	26	30	27	27	27
50 300	12	12	12	12	12	12	12	12
50 301	6	6	6	6	7	6	6	6
50 302	7	7	7	7	7	7	7	7
50 303	8	8	8	8	8	8	8	8
50 304	7	7	7	7	7	7	7	7
50 305	8	8	8	8	8	8	8	8
50 306	7	7	7	7	7	7	7	7
50 307	7	7	7	7	7	7	7	7
50 308	8	8	8	8	8	8	8	8
50 309	7	7	7	7	8	29	7	7
50 31	27	28	28	28	31	28	28	28
50 310	8	8	8	8	8	8	8	8
50 311	8	8	8	8	8	8	8	8
50 312	6	6	6	6	7	6	6	6
50 313	8	8	8	8	8	8	8	8
50 314	7	7	7	7	7	22	7	7
50 315	8	8	8	8	8	8	8	8
50 316	8	8	8	8	8	8	8	8
50 317	6	6	6	6	6	6	6	6
50 318	8	8	8	8	8	8	8	8
50 319	7	7	7	7	7	7	7	7
50 32	25	26	25	25	31	26	25	26
50 320	8	8	8	8	8	8	8	8
50 321	6	6	6	6	6	6	6	6
50 322	7	7	7	7	7	7	7	7
50 323	7	7	7	7	7	7	7	7
50 324	7	7	7	7	7	7	7	7
50 325	7	7	7	7	7	7	7	7

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 326	33	33	33	33	36	33	33	33
50 327	28	28	28	28	31	28	28	28
50 328	32	32	32	32	34	32	32	32
50 329	24	25	25	25	30	25	24	25
50 33	24	25	25	25	28	25	25	25
50 330	29	29	29	29	33	30	29	29
50 331	29	29	29	29	36	40	29	29
50 332	24	25	25	25	30	25	25	25
50 333	28	28	28	28	32	28	28	28
50 334	29	29	29	29	32	29	29	29
50 335	27	27	27	27	33	27	27	27
50 336	25	26	26	26	31	26	26	26
50 337	26	26	26	26	31	26	26	26
50 338	26	27	27	26	34	36	26	27
50 339	27	28	27	27	32	29	27	27
50 34	30	30	30	30	32	30	30	30
50 340	27	29	28	28	33	32	28	28
50 341	27	27	27	27	33	27	27	27
50 342	27	28	28	28	33	29	28	28
50 343	26	27	27	27	31	28	27	27
50 344	30	30	30	30	33	30	30	30
50 345	29	30	29	29	35	29	29	30
50 346	27	27	27	27	30	27	27	27
50 347	25	26	26	25	33	31	25	26
50 348	30	30	30	30	33	30	30	30
50 349	28	29	28	28	33	29	28	29
50 35	31	31	32	31	33	32	32	33
50 350	23	25	24	24	28	32	24	24
50 351	12	12	12	12	12	12	12	12
50 352	10	10	10	10	11	10	10	10
50 353	13	13	13	13	14	13	13	13
50 354	13	13	13	14	14	14	13	14
50 355	11	11	11	11	11	11	11	11
50 356	15	15	15	15	16	15	15	15
50 357	12	12	12	12	13	12	12	12
50 358	11	11	11	11	11	11	11	11
50 359	10	10	10	10	10	10	10	10
50 36	31	31	31	31	35	31	31	31
50 360	12	12	12	12	13	12	12	12
50 361	11	11	11	11	12	11	11	11
50 362	10	10	10	10	11	10	10	10
50 363	11	11	12	12	12	12	11	12
50 364	13	13	13	13	13	13	13	13
50 365	11	11	11	11	11	11	11	11
50 366	13	13	13	13	14	13	13	13

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 367	12	12	12	12	12	12	12	12
50 368	12	12	12	12	12	12	12	12
50 369	12	12	12	12	13	12	12	12
50 37	32	32	32	32	36	32	32	32
50 370	12	12	12	12	12	12	12	12
50 371	11	11	11	11	12	12	11	11
50 372	10	10	10	10	11	10	10	10
50 373	12	12	12	12	13	12	12	12
50 374	11	11	11	11	11	11	11	11
50 375	13	13	13	13	14	13	13	13
50 376	7	7	7	7	7	7	7	7
50 377	7	7	7	7	7	7	7	7
50 378	8	8	8	8	8	8	8	8
50 379	7	7	7	7	7	7	7	7
50 38	31	31	31	31	35	31	31	31
50 380	7	7	7	7	7	7	7	7
50 381	8	8	8	8	8	8	8	8
50 382	6	6	6	6	6	6	6	6
50 383	7	7	7	7	7	7	7	7
50 384	8	8	8	8	9	8	8	8
50 385	7	7	7	7	7	7	7	7
50 386	7	7	7	7	7	7	7	7
50 387	8	8	8	8	8	8	8	8
50 388	7	7	7	7	7	7	7	7
50 389	8	8	8	8	8	8	8	8
50 39	29	29	29	29	35	29	29	29
50 390	7	7	7	7	8	7	7	7
50 391	7	7	7	7	7	7	7	7
50 392	8	8	8	8	8	8	8	8
50 393	7	7	7	7	7	7	7	7
50 394	8	8	8	8	8	8	8	8
50 395	7	7	7	7	7	7	7	7
50 396	8	8	8	8	8	8	8	8
50 397	7	7	7	7	7	7	7	7
50 398	6	6	6	6	7	6	6	6
50 399	7	7	7	7	8	7	7	7
50 4	7	7	7	7	7	7	7	7
50 40	26	26	26	26	32	27	26	27
50 400	8	8	8	8	8	8	8	8
50 401	28	28	28	28	31	28	28	28
50 402	27	27	27	27	30	27	27	28
50 403	33	34	34	34	36	34	34	34
50 404	29	32	31	31	32	31	31	31
50 405	27	27	27	27	29	27	27	27
50 406	32	34	32	32	36	32	32	33

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 407	27	30	29	29	30	29	29	29
50 408	26	26	26	26	28	26	26	26
50 409	30	33	33	33	34	33	33	33
50 41	25	26	26	25	32	26	26	26
50 410	28	28	28	28	30	28	28	29
50 411	29	29	29	29	32	29	29	30
50 412	26	26	26	26	29	26	26	26
50 413	28	30	30	30	32	30	30	31
50 414	27	27	27	27	28	27	27	27
50 415	26	29	28	28	32	28	28	29
50 416	27	27	27	27	29	27	27	27
50 417	30	30	30	30	32	30	30	30
50 418	26	28	27	27	29	27	27	28
50 419	32	33	33	33	34	33	33	34
50 42	23	24	24	24	31	24	24	24
50 420	27	28	28	28	30	28	28	28
50 421	34	34	34	34	35	34	34	35
50 422	26	29	29	29	31	29	29	29
50 423	27	29	29	29	31	29	29	29
50 424	27	27	27	27	30	27	27	27
50 425	34	34	34	34	35	34	34	35
50 426	11	11	11	11	12	11	11	11
50 427	12	12	12	12	12	12	12	12
50 428	13	13	13	13	13	13	13	13
50 429	11	11	11	11	11	11	11	11
50 43	25	26	25	25	31	25	25	26
50 430	14	14	14	14	15	14	14	14
50 431	11	11	11	11	11	11	11	11
50 432	12	12	12	12	13	12	12	12
50 433	12	12	12	12	12	12	12	12
50 434	11	11	11	11	11	11	11	11
50 435	11	11	11	11	11	11	11	11
50 436	11	11	11	11	11	11	11	11
50 437	12	12	12	12	13	12	12	13
50 438	10	10	10	10	11	10	10	10
50 439	12	12	12	12	13	12	12	12
50 44	24	25	25	25	31	25	25	25
50 440	13	13	13	13	13	13	13	13
50 441	11	11	11	11	11	11	11	11
50 442	12	12	12	12	13	12	12	12
50 443	11	11	11	11	12	11	11	11
50 444	12	12	12	12	12	12	12	12
50 445	12	12	12	12	12	12	12	12
50 446	12	12	12	12	13	12	12	12
50 447	13	13	13	13	14	13	13	13

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 448	12	12	12	12	13	12	12	12
50 449	11	11	11	11	11	11	11	11
50 45	24	25	25	25	28	25	25	25
50 450	11	11	11	11	11	11	11	11
50 451	8	8	8	8	8	8	8	8
50 452	8	8	8	8	8	8	8	8
50 453	7	7	7	7	7	7	7	7
50 454	8	8	8	8	8	8	8	8
50 455	6	6	6	6	6	6	6	6
50 456	8	8	8	8	8	8	8	8
50 457	8	8	8	8	8	8	8	8
50 458	7	7	7	7	7	7	7	7
50 459	7	7	7	7	7	7	7	7
50 46	28	29	28	28	33	29	28	29
50 460	7	7	7	7	7	7	7	7
50 461	6	6	6	6	6	6	6	6
50 462	7	7	7	7	7	7	7	7
50 463	8	8	8	8	8	8	8	8
50 464	6	6	6	6	6	6	6	6
50 465	8	8	8	8	8	8	8	8
50 466	7	7	7	7	7	7	7	7
50 467	9	9	9	9	9	9	9	9
50 468	7	7	7	7	7	7	7	7
50 469	8	8	8	8	8	8	8	8
50 47	28	28	28	28	33	45	28	28
50 470	8	8	8	8	8	8	8	8
50 471	7	7	7	7	7	7	7	7
50 472	8	8	8	8	8	8	8	8
50 473	7	7	7	7	7	7	7	7
50 474	7	7	7	7	7	7	7	7
50 475	6	6	6	6	6	6	6	6
50 476	26	28	28	28	28	28	28	28
50 477	27	29	29	29	29	29	29	29
50 478	29	32	32	32	32	32	32	32
50 479	28	28	28	28	28	28	28	28
50 48	27	28	27	27	32	27	27	28
50 480	34	34	34	34	34	34	34	34
50 481	26	28	28	28	28	28	28	28
50 482	26	27	27	27	27	27	27	27
50 483	28	30	30	30	30	30	30	30
50 484	30	32	32	32	32	32	32	32
50 485	29	31	31	31	31	31	31	31
50 486	30	32	32	32	32	32	32	32
50 487	30	31	31	31	31	31	31	31
50 488	28	31	31	31	31	31	31	31

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 489	33	35	35	35	35	35	35	35
50 49	24	25	25	25	31	25	25	25
50 490	29	29	29	29	29	29	29	29
50 491	33	35	35	35	35	35	35	35
50 492	28	30	29	29	29	29	29	29
50 493	27	30	30	30	30	30	30	30
50 494	30	32	32	32	32	32	32	32
50 495	34	34	34	34	34	34	34	34
50 496	27	29	29	29	29	29	29	29
50 497	28	30	30	30	30	30	30	30
50 498	28	30	30	30	30	30	30	30
50 499	31	33	33	33	33	33	33	33
50 5	7	7	7	7	7	7	7	7
50 50	26	27	27	27	32	27	27	27
50 500	30	34	34	34	34	34	34	34
50 501	12	12	12	12	12	12	12	12
50 502	10	10	10	10	10	10	10	10
50 503	13	13	13	13	13	13	13	13
50 504	11	11	11	11	11	11	11	11
50 505	12	12	12	12	12	12	12	12
50 506	11	11	11	11	11	11	11	11
50 507	13	13	13	13	13	13	13	13
50 508	14	14	14	14	14	14	14	14
50 509	13	13	13	13	13	13	13	13
50 51	12	12	12	12	12	12	12	12
50 510	11	11	11	11	11	11	11	11
50 511	13	13	13	13	13	13	13	13
50 512	13	13	13	13	13	13	13	13
50 513	12	12	12	12	12	12	12	12
50 514	12	12	12	12	12	12	12	12
50 515	11	11	11	11	11	11	11	11
50 516	13	13	13	13	13	13	13	13
50 517	14	14	14	14	14	14	14	14
50 518	11	11	11	11	11	11	11	11
50 519	12	12	12	12	12	12	12	12
50 52	11	11	11	11	11	11	11	11
50 520	11	11	11	11	11	11	11	11
50 521	10	10	10	10	10	10	10	10
50 522	11	11	11	11	11	11	11	11
50 523	11	11	11	11	11	11	11	11
50 524	14	14	14	14	14	14	14	14
50 525	11	11	11	11	11	11	11	11
50 53	12	12	13	13	13	13	13	13
50 54	11	11	11	11	12	11	11	11
50 55	13	13	13	13	14	13	13	13

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct		Chuffed	Alternative	
	LB	UB		CPSat	Cplex		CPO	CPSat
50 56	11	11	11	11	12	11	11	11
50 57	13	13	13	13	15	13	13	13
50 58	11	11	11	11	11	11	11	11
50 59	11	11	11	11	11	11	11	11
50 6	6	6	6	6	6	6	6	6
50 60	12	12	12	12	13	12	12	12
50 61	13	13	13	13	13	13	13	13
50 62	13	13	13	13	14	13	13	13
50 63	12	12	12	12	12	12	12	12
50 64	13	13	13	13	13	13	13	13
50 65	12	12	12	12	12	12	12	12
50 66	12	12	12	12	14	12	12	12
50 67	12	12	12	12	13	12	12	12
50 68	12	12	12	12	12	12	12	12
50 69	12	12	12	12	13	12	12	12
50 7	7	7	7	7	7	7	7	7
50 70	10	10	10	10	10	10	10	10
50 71	13	13	13	13	15	13	13	13
50 72	11	11	11	11	11	11	11	11
50 73	11	11	11	11	12	11	11	11
50 74	12	12	12	12	12	12	12	12
50 75	11	11	11	11	12	11	11	11
50 76	7	7	7	7	7	7	7	7
50 77	7	7	7	7	7	7	7	7
50 78	7	7	7	7	7	7	7	7
50 79	8	8	8	8	8	8	8	8
50 8	7	7	7	7	7	7	7	7
50 80	7	7	7	7	7	7	7	7
50 81	7	7	7	7	7	7	7	7
50 82	6	6	6	6	6	6	6	6
50 83	8	8	8	8	8	8	8	8
50 84	7	7	7	7	7	7	7	7
50 85	8	8	8	8	8	8	8	8
50 86	7	7	7	7	7	7	7	7
50 87	8	8	8	8	8	8	8	8
50 88	8	8	8	8	8	8	8	8
50 89	7	7	7	7	7	7	7	7
50 9	9	9	9	9	9	9	9	9
50 90	7	7	7	7	8	7	7	7
50 91	7	7	7	7	7	7	7	7
50 92	7	7	7	7	7	7	7	7
50 93	7	7	7	7	7	7	7	7
50 94	7	7	7	7	7	7	7	7
50 95	7	7	7	7	7	7	7	7
50 96	7	7	7	7	7	7	7	7

Table 10.1: Result Comparisoon for SALBP

Instance	SALOME		CPO	Direct			Alternative	
	LB	UB		CPSat	Cplex	Chuffed	CPO	CPSat
50 97	7	7	7	7	7	7	7	7
50 98	8	8	8	8	8	8	8	8
50 99	7	7	7	7	7	7	7	7