Mathematical models and an effective exact algorithm for unrelated parallel machine scheduling with family setup times and machine cost

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1 Detailed computational results

This appendix provides detailed experimental results from the main text. For the reader's convenience, Table 1 provides the correspondence between the tables in the current text and the tables in the main text.

Table 1: the correspondence between the tables in the current text and the tables in the main text.

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Table 2: Results of the B&P algorithm on small-scale instances.

m	n	f	BP_1					BP_2					BP_3					BP_4				
			Opt	$Gap(\%)$	$Nodes$	T_{opt}	$Time(ms)$	Opt	$Gap(\%)$	$Nodes$	T_{opt}	$Time(ms)$	Opt	$Gap(\%)$	$Nodes$	T_{opt}	$Time(ms)$	Opt	$Gap(\%)$	$Nodes$	T_{opt}	$Time(ms)$
3	10	3	10	0.00	1.2	20	20	10	0.00	1.2	12	12	10	0.00	1.0	22	22	10	0.00	1.0	13	13
		5	10	0.00	1.0	22	22	10	0.00	1.0	14	14	10	0.00	1.0	25	25	10	0.00	1.0	16	16
		8	10	0.00	1.0	21	21	10	0.00	1.0	16	16	10	0.00	1.0	28	28	10	0.00	1.0	15	15
	20	3	10	0.00	1.6	299	299	10	0.00	2.0	291	291	10	0.00	2.2	925	925	10	0.00	1.6	434	434
		5	10	0.00	1.0	216	216	10	0.00	1.0	183	183	10	0.00	1.0	368	368	10	0.00	1.0	273	273
		8	10	0.00	1.4	297	297	10	0.00	1.4	236	236	10	0.00	1.4	521	521	10	0.00	1.4	397	397
	30	3	10	0.00	3.6	2565	2565	10	0.00	3.8	2770	2770	10	0.00	4.2	4308	4308	9	< 0.001	5.0	4026	4663
		5	10	0.00	1.4	1691	1691	10	0.00	1.2	1513	1513	10	0.00	1.2	2788	2788	10	0.00	1.2	2421	2421
		8	10	0.00	2.8	2925	2925	9	< 0.001	1.6	1566	1744	10	0.00	1.4	3086	3086	10	0.00	1.2	2550	2550
	40	3	10	0.00	2.6	9937	9937	10	0.00	2.8	9989	9989	10	0.00	4.4	19705	19705	9	< 0.001	37.2	14820	195459
		5	10	0.00	18.8	90140	90140	10	0.00	4.0	16798	16798	10	0.00	3.4	26047	26047	10	0.00	1.8	16284	16284
		8	10	0.00	6.2	19814	19814	10	0.00	4.8	17922	17922	10	0.00	3.8	23224	23224	9	0.00	24.8	25771	203877
	50	3	10	0.00	3.0	42554	42554	10	0.00	2.6	37479	37479	10	0.00	2.8	48146	48146	9	< 0.001	23.8	170022	333686
		5	8	0.07	30.6	47892	400647	10	0.00	4.4	50418	50418	9	0.01	22.6	189857	353701	8	0.08	24.8	140275	475208
		8	8	0.08	36.0	76996	424992	10	0.00	10.6	72806	72806	8	0.06	50.0	260639	570732	7	0.14	42.0	48330	578314
4	10	3	10	0.00	1.2	12	12	10	0.00	1.2	9	9	10	0.00	1.2	12	12	10	0.00	1.2	10	10
		5	10	0.00	1.2	14	14	10	0.00	1.2	11	11	10	0.00	1.2	14	14	10	0.00	1.2	11	11
		8	10	0.00	1.0	13	13	10	0.00	1.0	10	10	10	0.00	1.0	15	15	10	0.00	1.0	10	10
	20	3	10	0.00	1.4	138	138	10	0.00	1.4	100	100	10	0.00	1.4	213	213	10	0.00	1.4	154	154
		5	10	0.00	1.4	138	138	10	0.00	1.4	110	110	10	0.00	1.2	197	197	10	0.00	1.2	137	137
		8	10	0.00	1.2	140	140	10	0.00	1.2	122	122	10	0.00	1.0	207	207	10	0.00	1.0	129	129
	30	3	10	0.00	1.2	591	591	10	0.00	1.2	510	510	10	0.00	1.2	949	949	10	0.00	1.2	785	785
		5	10	0.00	3.2	1255	1255	10	0.00	3.0	1151	1151	10	0.00	3.6	2380	2380	10	0.00	2.8	2036	2036
		8	10	0.00	1.8	1070	1070	10	0.00	2.4	1183	1183	10	0.00	1.6	1838	1838	10	0.00	1.4	1437	1437
	40	3	10	0.00	15.4	23190	23190	10	0.00	5.0	5414	5414	8	0.06	120.0	4545	364519	9	0.03	54.0	6423	186925
		5	9	0.00	5.2	10396	10052	9	< 0.001	4.8	7278	7328	8	0.03	98.8	7104	366964	8	0.03	68.0	9519	368123
		8	7	0.02	65.0	38233	215132	9	< 0.001	6.2	10103	9673	7	0.08	120.0	7008	366631	7	0.02	84.4	9730	375821
	50	3	10	0.00	1.6	9110	9110	10	0.00	1.4	9915	9915	10	0.00	1.8	16277	16277	10	0.00	1.6	15996	15996
		5	10	0.00	2.6	13733	13733	10	0.00	2.6	14369	14369	10	0.00	4.2	26914	26914	10	0.00	3.6	27764	27764
		8	10	0.00	4.8	29541	29541	9	< 0.001	4.0	18476	21156	9	0.01	23.2	22258	200144	10	0.00	3.4	30003	30003
5	10	3	10	0.00	1.2	11	11	10	0.00	1.6	11	11	10	0.00	1.2	14	14	10	0.00	1.2	9	9
		5	10	0.00	1.0	9	9	10	0.00	1.0	9	9	10	0.00	1.0	11	11	10	0.00	1.0	10	10
		8	10	0.00	1.0	9	9	10	0.00	1.0	9	9	10	0.00	1.0	11	11	10	0.00	1.0	9	9
	20	3	10	0.00	1.2	69	69	10	0.00	1.2	61	61	10	0.00	1.2	101	101	10	0.00	1.2	71	71
		5	10	0.00	3.6	187	187	10	0.00	2.6	118	118	10	0.00	2.4	198	198	10	0.00	1.8	98	98
		8	10	0.00	1.2	94	94	10	0.00	1.2	75	75	10	0.00	1.2	152	152	10	0.00	1.2	79	79
	30	3	10	0.00	3.4	702	702	10	0.00	2.8	685	685	10	0.00	2.8	1222	1222	10	0.00	4.0	1267	1267
		5	10	0.00	4.4	856	856	10	0.00	4.6	1037	1037	10	0.00	5.6	3630	3630	10	0.00	3.4	1115	1115
		8	10	0.00	1.4	591	591	10	0.00	1.4	579	579	10	0.00	1.4	1007	1007	10	0.00	1.4	941	941
	40	3	10	0.00	3.0	1946	1946	10	0.00	2.4	1944	1944	10	0.00	3.2	3218	3218	10	0.00	2.4	3104	3104
		5	9	0.03	54.2	5412	185143	10	0.00	7.0	6202	6202	9	0.03	68.0	6181	186180	8	0.08	97.0	8245	367901
		8	9	0.00	6.4	4316	5460	10	0.00	4.2	3688	3688	10	0.00	2.6	4230	4230	10	0.00	7.8	9321	9321
	50	3	9	0.04	47.0	25689	203640	10	0.00	11.2	21397	21397	10	0.00	16.0	49563	49563	7	0.10	100.8	25462	560263
		5	9	0.04	61.0	17274	196483	10	0.00	6.6	14014	14014	10	0.00	8.4	34305	34305	7	0.12	92.2	10783	549764
		8	9	0.03	57.2	17261	198496	10	0.00	10.4	22279	22279	8	0.09	73.2	12961	375227	7	0.11	77.2	11593	550138
Sum/Avg.			437	0.01	10.4	11053	46533	**446**	**0.00**	**3.1**	**7842**	**7897**	436	0.01	14.9	17476	67999	424	0.02	17.6	13375	108156

Table 3: Results of the B&P algorithm on large-scale instances.

m	n	f	BP_1					BP_2					BP_3					BP_4				
			Opt	*Gap*(%)	*Nodes*	$T_{opt}(ms)$	*Time*(*ms*)	*Opt*	*Gap*(%)	*Nodes*	$T_{opt}(ms)$	*Time*(*s*)	*Opt*	*Gap*(%)	*Nodes*	$T_{opt}(ms)$	*Time*(*ms*)	*Opt*	*Gap*(%)	*Nodes*	$T_{opt}(ms)$	*Time*(*ms*)
5	60	5	10	0.00	8.4	46814	46814	10	0.00	9.6	54174	54174	9	< 0.001	7.8	38923	69976	9	0.01	22.2	44475	223422
		8	9	0.03	23.6	49957	228047	10	0.00	8.2	43644	43644	9	0.03	31.6	47430	224231	8	0.07	38.0	39085	396790
		12	6	0.17	98.2	97063	782597	10	0.00	27.8	106427	106427	6	0.16	92.4	33891	744249	6	0.18	55.0	34633	588165
	70	5	7	0.23	47.8	53446	581949	10	0.00	25.4	153394	153394	9	0.08	17.0	85084	258330	9	0.08	14.8	143434	310222
		8	6	0.07	59.0	150101	817499	10	0.00	15.4	179813	179813	7	0.36	30.8	121611	628340	7	0.36	29.0	133823	641115
		12	3	0.47	106.6	150159	1318056	10	0.00	38.8	354993	354993	4	0.62	65.0	191500	1168482	6	0.59	38.8	148712	815145
	80	5	7	0.10	38.2	242631	719393	10	0.00	23.8	277951	277951	4	0.14	46.6	148570	1154402	6	0.37	25.4	188791	844825
		8	4	1.48	56.4	417999	1261196	8	0.00	40.4	485840	621480	6	1.30	30.2	351769	937360	3	2.49	46.2	334657	1379426
		12	2	1.76	55.2	50350	1468794	7	0.19	55.2	531061	918018	3	1.54	43.2	278278	1353875	2	1.42	42.2	87562	1470496
	90	5	6	0.59	23.2	240300	877096	9	0.18	13.6	394686	535505	6	0.56	23.6	670740	1132361	4	0.66	23.6	230537	1191922
		8	5	1.07	28.6	465965	1145708	7	0.10	24.2	494207	788401	4	1.57	22.2	356455	1233975	2	1.42	26.0	172959	1496855
		12	1	2.23	39.0	182097	1657263	4	0.09	53.0	904938	1463075	1	2.31	26.2	232891	1501409	1	2.92	27.4	503203	1687793
	100	5	3	2.26	29.6	184610	1335461	5	0.72	17.0	464495	921281	3	1.83	15.4	298742	1225447	3	2.20	20.8	302137	1372973
		8	3	1.34	25.2	862422	1534487	7	0.52	18.2	746392	1073082	4	2.07	13.8	985327	1486150	3	2.35	14.8	360451	1389414
		12	1	2.53	22.0	307076	1672477	5	1.21	23.8	809965	1319211	1	2.68	17.8	460505	1682804	1	3.26	19.6	555301	1701076
8	60	5	10	0.00	8.0	10001	10001	10	0.00	10.8	12123	12123	9	< 0.001	13.8	11824	21915	10	0.00	6.8	15680	15680
		8	10	0.00	27.0	49471	49471	10	0.00	17.0	25257	25257	9	0.07	48.6	137131	303989	10	0.00	14.8	41394	41394
		12	6	0.17	163.6	14780	730171	10	0.00	23.6	44324	44324	7	0.13	77.8	22273	557176	8	0.01	51.4	33215	388919
	70	5	8	0.08	60.0	24176	385192	10	0.00	12.6	26951	26951	9	0.07	32.6	29794	207024	9	0.06	30.4	33020	210075
		8	8	0.06	75.6	31699	386973	10	0.00	12.6	40634	40634	8	0.06	47.2	36174	390274	8	0.04	38.8	33400	390916
		12	7	0.06	71.6	21204	556466	10	0.00	11.0	37188	37188	6	0.07	66.4	23908	738093	9	0.01	19.8	55483	230586
	80	5	6	0.45	93.2	28541	568221	10	0.00	53.4	181341	181341	7	0.39	61.8	100590	613804	5	0.38	83.4	149140	814185
		8	3	0.54	140.8	55042	1288384	10	0.00	79.0	275710	275710	2	1.19	106.6	78968	1470152	3	1.16	84.8	349411	1210264
		12	5	0.19	114.0	23231	916861	9	0.02	93.8	176909	339602	4	0.97	77.6	34608	1106938	5	0.46	64.2	41976	932301
	90	5	6	0.15	94.6	276998	890285	8	0.01	80.8	269018	419001	5	0.61	66.4	38167	927110	5	2.07	50.2	50359	940482
		8	4	0.33	100.0	139642	1147998	8	0.04	88.0	329284	625864	3	0.60	64.0	120244	1310877	3	2.30	65.2	248848	1355207
		12	2	1.08	103.4	131823	1479101	10	0.00	82.0	600755	600755	1	0.59	72.8	41055	1635074	5	2.00	37.6	329622	1077224
	100	5	5	0.84	67.8	241046	1029709	10	0.00	58.2	541482	541482	6	0.61	35.6	182956	836620	3	1.95	50.6	89313	1304274
		8	0	3.46	105.0	-	1817330	6	0.66	105.8	659134	1123534	2	4.77	54.6	516447	1557871	1	4.76	52.0	235724	1672382
		12	4	1.56	53.6	79786	1125608	9	0.01	74.2	753702	859833	3	1.91	46.8	245970	1346060	3	2.63	36.8	136172	1317318
10	60	5	10	0.00	31.2	29551	29551	10	0.00	39.0	34857	34857	10	0.00	30.8	35398	35398	10	0.00	25.6	36340	36340
		8	10	0.00	16.2	14543	14543	10	0.00	17.2	16607	16607	9	0.06	37.2	11422	191336	10	0.00	21.4	35973	35973
		12	10	0.00	17.6	44080	44080	9	< 0.001	14.0	20221	20276	9	< 0.001	12.4	21835	23588	9	< 0.001	19.6	34641	38148
	70	5	10	0.00	25.2	39110	39110	10	0.00	28.0	36595	36595	9	0.03	48.6	29222	207750	10	0.00	40.0	102278	102278
		8	7	0.04	150.2	48769	575757	9	< 0.001	36.4	58993	56315	5	0.13	95.4	59627	584847	6	0.12	89.0	65486	417175
		12	6	0.12	156.8	151450	813617	10	0.00	61.2	114229	114229	6	0.23	110.2	68715	768714	9	0.03	72.8	243870	402167
	80	5	8	0.31	125.4	214974	534748	9	< 0.001	74.6	183425	168569	3	0.41	133.8	49331	1288687	5	0.23	127.2	138799	981177
		8	10	0.00	15.6	66874	66874	9	< 0.001	18.2	72767	74757	7	0.03	36.6	67437	414999	9	0.00	32.6	169291	334059
		12	4	0.34	151.8	302566	1209028	10	0.00	95.2	243540	243540	5	0.24	113.6	237973	1025931	7	0.15	102.0	366142	801252
	90	5	9	0.01	46.2	188727	354410	10	0.00	42.6	158608	158608	5	0.12	92.2	106432	959824	6	0.03	49.6	112403	625279
		8	2	1.98	150.6	79840	1467358	8	0.35	157.2	399586	679760	1	1.02	126.2	23317	1639527	3	1.40	91.2	414651	1406248
		12	4	0.71	102.0	89440	1126843	7	0.05	100.4	229164	548022	3	0.27	89.0	304848	1361016	5	0.10	67.8	465170	1144455
	100	5	5	0.84	97.6	31780	923724	8	0.25	124.8	290256	594112	5	1.45	69.8	52050	935493	5	1.66	43.8	49581	942901
		8	4	1.11	104.6	359982	1235085	9	0.01	131.2	627700	745639	2	1.16	93.4	418540	1537424	4	1.89	45.4	185022	1009683
		12	1	1.76	124.2	75057	1646057	7	0.16	133.0	524652	910199	3	2.48	64.8	372824	1381426	2	2.64	59.4	131985	1479787
Sum/Avg.			257	0.68	72.3	144663	842431	**397**	**0.11**	50.4	288600	**408136**	239	0.83	55.8	172907	892896	257	1.01	44.8	**170537**	825950

Table 4: Comparison results between I3 and AR, AR-FP, and AF on small instances.

m	n	f	AR				AR-FP				AF				I3			
			Opt	feaSol	Gap(%)	Time(ms)	Opt	feaSol	Gap(%)	Time(ms)	Opt	feaSol	Gap(%)	Time(ms)	Opt	feaSol	Gap(%)	Time(ms)
		3	1	5	16.65	511448	1	5	15.01	503490	5	5	0.00	5345	5	5	0.00	522
	10	5	5	5	0.00	311610	5	5	0.00	241692	5	5	0.00	15034	5	5	0.00	834
		8	3	5	5.65	316413	4	5	2.48	156297	5	5	0.00	8879	5	5	0.00	2093
		3	0	5	87.62	600008	0	5	82.79	600007	0	5	4.59	600076	0	5	11.45	600034
	20	5	0	5	88.91	600008	0	5	74.52	600004	0	5	64.22	601071	0	5	20.66	600029
		8	0	5	85.35	600010	0	5	58.25	600009	0	5	76.04	601261	0	5	22.61	600050
		3	0	5	93.24	600018	0	5	90.61	600008	0	4	63.52	600719	0	5	19.91	600216
3	30	5	0	5	94.27	600434	0	5	91.81	600113	0	5	85.57	604776	0	5	35.76	610706
		8	0	5	93.40	600036	0	5	87.10	600030	0	2	96.27	609696	0	5	42.71	600061
		3	0	5	94.03	601953	0	5	91.44	605573	0	0	100.00	602019	0	5	33.41	600082
	40	5	0	5	95.22	600102	0	5	92.09	601508	0	0	100.00	603657	0	5	44.71	600058
		8	0	5	95.71	602777	0	5	93.21	614062	0	0	100.00	609400	0	5	52.29	600066
		3	0	5	95.20	600510	0	5	93.10	608110	0	0	100.00	610834	0	5	42.34	600178
	50	5	0	5	96.21	611719	0	5	93.14	607138	0	0	100.00	604125	0	5	47.45	600141
		8	0	5	96.74	600375	0	5	94.51	601578	0	0	100.00	630987	0	5	56.50	600190
		3	0	5	33.87	634522	0	5	27.12	617207	5	5	0.00	6806	5	5	0.00	978
	10	5	3	5	6.84	391148	3	5	2.84	369888	5	5	0.00	8170	5	5	0.00	851
		8	5	5	0.00	314188	5	5	0.00	133564	5	5	0.00	6694	5	5	0.00	2016
		3	0	5	90.68	600010	0	5	86.13	600009	0	5	3.63	626763	0	5	8.92	600010
	20	5	0	5	90.50	600007	0	5	78.87	600010	0	5	22.72	607896	0	5	11.21	600019
		8	0	5	83.44	600007	0	5	68.64	600015	0	3	80.50	609903	0	5	18.18	600009
		3	0	5	93.21	600007	0	5	89.81	600012	0	0	100.00	602464	0	5	16.29	600043
4	30	5	0	5	93.92	600011	0	5	90.85	600012	0	0	100.00	601204	0	5	23.81	600039
		8	0	5	94.02	600712	0	5	89.51	600014	0	0	100.00	600519	0	5	32.63	600059
		3	0	5	94.35	600074	0	5	92.67	600043	0	0	100.00	605341	0	5	24.50	600093
	40	5	0	5	95.02	603543	0	5	93.69	600239	0	0	100.00	606152	0	5	32.79	600108
		8	0	5	95.41	604977	0	5	93.71	600427	0	0	100.00	604316	0	5	42.93	600100
		3	0	5	95.79	607688	0	5	94.56	603557	0	0	100.00	611683	0	5	30.68	600186
	50	5	0	5	96.11	617268	0	5	95.40	609724	0	0	100.00	684460	0	5	40.35	600146
		8	0	5	96.29	607376	0	5	94.88	604984	0	0	100.00	634799	0	5	52.77	600164
		3	0	5	50.00	600018	0	5	37.59	600964	5	5	0.00	6133	5	5	0.00	482
	10	5	1	5	22.22	582435	4	5	2.05	448133	5	5	0.00	10051	5	5	0.00	590
		8	1	5	8.24	522723	4	5	2.24	228290	5	5	0.00	10685	5	5	0.00	1236
		3	0	5	91.31	600288	0	5	86.87	600620	5	5	0.00	329458	0	5	4.74	600018
	20	5	0	5	90.39	613912	0	5	78.18	605607	2	5	3.26	490155	2	5	3.34	457224
		8	0	5	82.52	611634	0	5	70.60	602185	0	5	33.28	603485	0	5	11.62	600021
		3	0	5	93.99	610733	0	5	92.60	601999	0	0	100.00	612352	0	5	15.77	600042
5	30	5	0	5	93.82	606722	0	5	91.58	608705	0	0	100.00	601607	0	5	13.00	600036
		8	0	5	94.70	603329	0	5	91.01	629054	0	0	100.00	601423	0	5	28.92	600053
		3	0	5	94.68	624602	0	5	92.94	619477	0	0	100.00	600586	0	5	23.90	600127
	40	5	0	5	94.95	603889	0	5	93.25	606652	0	0	100.00	600693	0	5	25.90	600134
		8	0	5	95.71	604409	0	5	94.17	620813	0	0	100.00	618080	0	5	38.29	600178
		3	0	5	95.13	600534	0	5	94.07	613869	0	0	100.00	601038	0	5	28.78	600152
	50	5	0	5	96.04	600315	0	5	94.60	603393	0	0	100.00	601331	0	5	34.79	600192
		8	0	5	96.64	601671	0	5	95.09	601957	0	0	100.00	604540	0	5	42.44	600133
Sum./Avg.			19	**225**	77.73	576137	26	**225**	72.79	557134	**52**	99	65.19	480370	47	**225**	**23.03**	**477349**

Table 5: Comparison results between I3 and AR, and AR-FP on small instances.

m	n	f	RA				RA-FP				I3			
			Opt	feaSol	Gap(%)	Time(ms)	Opt	feaSol	Gap(%)	Time(ms)	Opt	feaSol	Gap(%)	Time(ms)
		5	0	5	97.21	625455	0	5	96.32	606695	0	5	36.78	600156
	60	8	0	5	97.55	661022	0	5	96.36	607111	0	5	44.97	600203
		12	0	5	97.68	620841	0	5	97.39	606585	0	5	56.08	600191
		5	0	0	100.00	601831	0	5	97.40	645264	0	5	42.86	600227
	70	8	0	2	99.39	602148	0	5	98.12	674149	0	5	51.56	600126
		12	0	4	98.66	619248	0	5	98.27	602324	0	5	53.85	600255
		5	0	3	99.07	606760	0	5	97.91	603368	0	5	49.78	600566
5	80	8	0	2	99.46	602400	0	5	98.07	600419	0	5	56.49	600512
		12	0	1	99.78	600033	0	5	98.29	605447	0	5	62.49	600653
		5	0	2	99.71	612055	0	5	98.10	608332	0	3	83.73	600276
	90	8	0	1	99.79	600016	0	5	98.40	604814	0	3	87.53	600761
		12	0	1	99.81	619418	0	5	98.73	600361	0	5	73.44	600314
		5	0	0	100.00	600425	0	5	98.31	600120	0	0	100.00	600233
	100	8	0	0	100.00	603448	0	5	98.69	600979	0	0	100.00	600216
		12	0	0	100.00	606078	0	5	98.83	602721	0	2	93.37	600240
		5	0	2	99.08	610811	0	5	98.01	605070	0	5	21.46	600161
	60	8	0	1	99.61	613346	0	5	98.49	603824	0	5	27.67	600161
		12	0	5	97.72	600231	0	5	98.56	628670	0	5	35.79	600113
		5	0	1	99.47	689337	0	5	98.47	601972	0	5	34.96	601472
	70	8	0	1	99.68	606379	0	5	98.38	600056	0	5	37.31	602717
		12	0	0	100.00	602773	0	5	99.03	705264	0	5	50.54	600835
		5	0	0	100.00	607145	0	5	98.64	606585	0	2	91.10	600285
8	80	8	0	1	99.70	612166	0	5	98.91	603697	0	4	77.91	600302
		12	0	0	100.00	611861	0	5	98.89	607642	0	4	82.09	600301
		5	0	0	100.00	624135	0	5	98.87	612997	0	0	100.00	600219
	90	8	0	0	100.00	600388	0	5	98.80	612337	0	0	100.00	600238
		12	0	0	100.00	674465	0	5	99.30	630552	0	0	100.00	600285
		5	0	0	100.00	613581	0	5	98.75	602056	0	0	100.00	600264
	100	8	0	0	100.00	602105	0	5	99.20	675540	0	0	100.00	600280
		12	0	0	100.00	600042	0	5	99.23	613847	0	0	100.00	600284
		5	0	1	99.46	612734	0	5	98.65	602898	0	5	18.09	600204
	60	8	0	1	99.47	600185	0	5	98.53	600036	0	5	20.24	601877
		12	0	3	98.79	602284	0	5	98.73	616567	0	5	29.00	602189
		5	0	0	100.00	600777	0	5	98.72	602184	0	5	72.01	600333
	70	8	0	1	99.59	601634	0	5	98.87	601634	0	5	52.29	601085
		12	0	0	100.00	600126	0	5	99.09	600682	0	5	58.20	600815
		5	0	0	100.00	600098	0	5	98.95	606301	0	0	100.00	600189
10	80	8	0	0	100.00	600023	0	5	99.06	602888	0	0	100.00	600215
		12	0	0	100.00	600030	0	5	99.26	602430	0	0	100.00	600252
		5	0	0	100.00	600085	0	5	99.33	600084	0	1	87.40	600252
	90	8	0	0	100.00	600798	0	5	99.31	603932	0	0	100.00	600276
		12	0	0	100.00	624203	0	5	99.32	600516	0	0	100.00	600228
		5	0	0	100.00	645110	0	5	99.39	603148	0	0	100.00	600313
	100	8	0	0	100.00	613383	0	5	99.43	618505	0	0	100.00	600276
		12	0	0	100.00	603135	0	5	99.46	646148	0	0	100.00	600307
			0	48	99.57	612323	0	225	98.60	613039	0	129	70.87	600481

Table 6: Comparison results between BP_{sc} and BP_2 on small instances.

m	n	f	BP_{sc}						BP_2					
			Opt	Gaplp(%)	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gaplp(%)	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)
		3	5	0.00	0.00	1.0	17	17	5	0.00	0.00	1.0	9	9
	10	5	5	0.00	0.00	1.0	23	23	5	0.00	0.00	1.0	10	10
		8	5	0.00	0.00	1.0	28	28	5	0.00	0.00	1.0	13	13
		3	5	0.00	0.00	1.0	167	167	5	0.00	0.00	1.0	82	82
	20	5	5	1.77	0.00	4.2	633	633	5	1.49	0.00	1.8	133	133
		8	5	0.49	0.00	1.8	362	362	5	0.49	0.00	1.4	146	146
		3	5	0.00	0.00	1.0	888	888	5	0.00	0.00	1.0	345	345
3	30	5	5	0.87	0.00	5.8	4039	4039	5	0.01	0.00	1.4	518	518
		8	5	8.33	0.00	5.8	5767	5767	5	8.33	0.00	15.0	3311	3311
		3	5	0.73	0.00	1.8	4468	4468	5	0.00	0.00	1.0	1422	1422
	40	5	5	5.85	0.00	24.6	57425	57425	5	0.72	0.00	9.0	3855	3855
		8	5	4.68	0.00	3.8	12997	12997	5	4.22	0.00	6.6	5478	5478
		3	5	5.19	0.00	3.4	29482	29482	5	2.66	0.00	1.4	6666	6666
	50	5	5	2.12	0.00	6.2	57898	57898	5	0.00	0.00	1.0	5106	5106
		8	5	4.60	0.00	13.0	119927	119927	5	2.63	0.00	18.2	43551	43551
		3	5	0.01	0.00	1.4	15	15	5	0.01	0.00	1.4	9	9
	10	5	5	0.00	0.00	1.0	16	16	5	0.00	0.00	1.0	9	9
		8	5	0.00	0.00	1.0	23	23	5	0.00	0.00	1.0	12	12
		3	2	2.09	0.11	10.2	962	527	5	2.09	0.00	9.4	173	173
	20	5	5	0.20	0.00	1.8	223	223	5	0.00	0.00	1.0	63	63
		8	4	0.96	0.04	6.2	315	522	5	0.54	0.00	1.8	111	111
		3	5	6.11	0.00	719.8	147820	147820	5	5.83	0.00	44.6	3256	3256
4	30	5	5	1.50	0.00	5.4	3396	3396	5	1.27	0.00	2.6	591	591
		8	5	4.57	0.00	8.2	6077	6077	5	4.55	0.00	4.2	938	938
		3	4	2.70	0.00	111.0	123184	100902	5	2.63	0.00	53.4	13417	13417
	40	5	5	2.84	0.00	8.6	15188	15188	5	1.11	0.00	1.8	1165	1165
		8	5	3.18	0.00	7.8	17289	17289	5	1.04	0.00	1.4	1503	1503
		3	3	7.69	0.02	117.8	111385	194585	4	7.51	0.11	359.0	141801	233572
	50	5	5	2.16	0.00	3.8	18560	18560	5	2.01	0.00	2.2	7445	7445
		8	5	0.44	0.00	1.8	13943	13943	5	0.44	0.00	1.8	4385	4385
		3	5	0.00	0.00	1.0	14	14	5	0.00	0.00	1.0	5	5
	10	5	5	0.16	0.00	1.4	23	23	5	0.16	0.00	1.4	7	7
		8	5	0.00	0.00	1.0	17	17	5	0.00	0.00	1.0	5	5
		3	5	1.74	0.00	3.4	211	211	5	1.74	0.00	3.0	64	64
	20	5	5	0.00	0.00	1.0	104	104	5	0.00	0.00	1.0	45	45
		8	5	1.31	0.00	2.6	349	349	5	0.00	0.00	1.0	54	54
		3	5	2.90	0.00	24.6	7022	7022	5	2.82	0.00	82.6	3207	3207
5	30	5	5	0.00	0.00	1.0	442	442	5	0.00	0.00	1.0	237	237
		8	5	6.10	0.00	12.2	4398	4398	5	3.29	0.00	3.4	514	514
		3	5	6.24	0.00	14.2	13154	13154	5	4.93	0.00	81.8	13869	13869
	40	5	5	0.00	0.00	1.0	1307	1307	5	0.00	0.00	1.0	907	907
		8	5	2.07	0.00	5.8	8510	8510	5	2.00	0.00	1.8	1038	1038
		3	3	7.30	0.02	200.6	87783	293189	4	7.14	0.12	405.4	55723	164644
	50	5	5	3.18	0.00	3.0	11410	11410	5	1.94	0.00	12.6	8366	8366
		8	5	1.87	0.00	1.4	6041	6041	5	0.00	0.00	1.0	2191	2191
Sum./Avg.			216	2.27	**0.00**	30.1	19851	25764	**223**	**1.64**	0.01	**25.5**	**7372**	**11832**

Table 7: Comparison results between BP_{sc} and BP_2 on large instances.

m	n	f	BP_{sc}						BP2					
			Opt	Gaplp(%)	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gaplp(%)	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)
		5	5	5.79	0.00	5.8	43965	43965	5	4.14	0.00	7.0	10748	10748
	60	8	4	5.12	0.00	40.2	99925	200193	5	4.82	0.00	11.0	18387	18387
		12	5	7.71	0.00	16.6	143374	143374	5	6.33	0.00	15.8	29697	29697
		5	2	8.20	1.13	24.2	61673	387525	5	1.10	0.00	2.2	13118	13118
	70	8	1	11.62	2.51	32.2	245451	533996	5	1.29	0.00	2.2	14128	14128
		12	2	10.74	2.88	23.4	112912	409975	5	6.25	0.00	4.6	34879	34879
		5	2	13.11	3.19	16.6	471509	555940	5	7.70	0.00	8.6	83943	83943
5	80	8	0	9.01	2.24	24.2	-	605914	5	7.08	0.00	9.0	75087	75087
		12	4	10.50	0.04	6.6	169352	257051	5	5.51	0.00	4.2	51342	51342
		5	1	16.66	9.90	12.2	94147	507227	5	3.92	0.00	4.6	94390	94390
	90	8	1	12.69	8.87	9.4	48673	496065	4	5.50	0.20	10.6	48280	166726
		12	0	14.00	13.48	10.6	-	607282	5	13.18	0.00	6.6	149942	149942
		5	2	6.37	4.29	6.6	216662	452195	4	3.76	0.02	9.4	108802	207363
	100	8	0	12.50	7.43	9.8	-	608197	3	5.54	1.71	15.0	198421	370838
		12	0	16.76	16.20	9.0	-	607677	3	10.06	4.55	12.6	103404	315272
		5	4	4.30	0.00	161.0	154439	243813	4	4.24	0.04	715.0	177714	262286
	60	8	4	6.95	0.00	90.6	157888	246378	5	6.92	0.00	185.0	91608	91608
		12	4	6.47	0.00	45.4	39621	152326	5	2.46	0.00	1.8	4618	4618
		5	2	10.60	0.09	112.6	532087	575310	5	10.58	0.00	96.2	102441	102441
	70	8	5	6.09	0.00	9.0	62507	62507	4	5.97	0.02	108.6	8704	127245
		12	5	3.96	0.00	21.4	177077	177077	5	0.00	0.00	1.0	5751	5751
		5	1	11.44	4.79	70.2	58526	496581	1	11.31	1.50	477.4	22611	486142
8	80	8	5	5.19	0.00	9.0	139481	139481	5	3.48	0.00	1.8	10983	10983
		12	3	11.64	5.27	30.2	234772	383319	5	9.09	0.00	19.4	46205	46205
		5	0	11.13	6.43	43.4	-	607507	0	11.00	1.98	301.8	-	602338
	90	8	2	5.52	1.80	18.2	75959	394366	5	2.60	0.00	5.4	22629	22629
		12	1	11.07	3.05	25.0	501025	584535	5	8.86	0.00	25.4	125227	125227
		5	0	12.42	9.63	26.2	-	606496	1	12.48	3.52	131.8	475224	578807
	100	8	0	14.40	12.24	13.4	-	605864	4	7.89	0.06	17.0	62315	172367
		12	1	11.14	7.69	13.0	40576	492926	4	10.92	0.02	27.4	120924	217018
		5	4	5.63	0.00	117.0	62219	170179	5	5.66	0.00	231.4	59482	59482
	60	8	2	8.19	0.07	232.2	180147	432924	5	8.07	0.00	417.4	134318	134318
		12	5	6.69	0.00	17.0	51330	51330	5	0.00	0.00	1.0	4432	4432
		5	2	6.56	0.07	124.6	195979	439054	4	6.40	0.00	399.0	137032	229818
	70	8	3	10.67	0.04	118.2	451245	512372	4	10.42	0.19	273.4	125194	220211
		12	5	8.02	0.00	16.6	116761	116761	5	8.02	0.00	9.4	23452	23452
		5	0	10.19	4.53	91.0	-	606621	4	10.01	0.03	174.2	43350	154827
10	80	8	0	11.64	3.94	82.2	-	604520	3	11.50	0.06	259.4	133202	321643
		12	4	5.21	0.01	35.8	233007	307926	5	2.10	0.00	1.4	10186	10186
		5	1	6.48	3.57	45.8	14151	487766	3	6.58	0.76	215.4	216419	371079
	90	8	0	11.68	7.47	45.8	-	607230	1	11.52	1.39	254.6	77776	497351
		12	5	5.63	0.00	5.0	100432	100432	5	5.62	0.00	7.4	33098	33098
		5	0	6.69	4.18	42.2	-	606679	3	6.44	0.63	232.6	341816	446080
	100	8	0	13.80	10.81	29.4	-	606594	1	13.69	1.95	203.4	494109	579299
		12	4	6.12	0.08	7.4	92111	195002	5	1.80	0.00	16.2	78505	78505
Sum./Avg.			101	9.25	3.51	**43.2**	162999	400677	**185**	**6.71**	**0.41**	109.7	**95998**	**170118**

Table 8: Results for small-scale instances with different dominance relationship.

m	n	f	$\bar{b} \in [0.1, 0.2]$									$\bar{b} \in [0.2, 0.6]$									$\bar{b} \in [0.6, 1.2]$								
			Opt	Gap_{lb}	Gap	TWC	TUC	TC	Nodes	T_{opt}	Time	Opt	Gap_{lb}	Gap	TWC	TUC	TC	Nodes	T_{opt}	Time	Opt	Gap_{lb}	Gap	TWC	TUC	TC	Nodes	T_{opt}	Time
		3	5	5.00	0.00	35162	13112	30641	4.2	46	46	5	0.00	0.00	32157	26400	35221	1.0	11	11	5	0.00	0.00	35750	51385	56610	1.0	10	10
	10	5	5	1.68	0.00	38486	12521	32522	3.4	33	33	5	0.00	0.00	28468	23731	34234	1.0	11	11	5	0.09	0.00	35649	48161	52541	1.4	17	17
		8	5	1.78	0.00	34941	10263	36673	9.8	72	72	5	0.00	0.00	40192	23728	34720	1.0	14	14	5	1.01	0.00	33591	49241	53855	1.8	22	22
		3	5	3.45	0.00	67068	43319	80503	22.6	1043	1043	5	0.46	0.00	67273	77510	98082	1.4	102	102	5	0.00	0.00	77868	193153	201985	1.0	107	107
	20	5	5	1.74	0.00	74212	39925	87680	24.2	1024	1024	5	0.00	0.00	78369	83124	101891	1.0	126	126	5	0.00	0.00	84732	179252	187155	1.0	118	118
		8	5	0.31	0.00	78318	36764	84853	3.8	256	256	5	0.00	0.00	86420	81792	101617	1.0	114	114	5	0.22	0.00	106127	193140	202135	2.2	245	245
		3	5	0.35	0.00	112862	81351	148188	7.8	1502	1502	5	0.00	0.00	120891	198558	222270	1.0	518	518	5	0.00	0.00	112985	417944	429081	1.0	506	506
3	30	5	5	0.67	0.00	105076	78301	142986	10.2	3208	3208	5	0.00	0.00	134371	200502	223200	1.0	468	468	5	0.00	0.00	147953	410522	422586	1.0	693	693
		8	5	1.19	0.00	127152	79109	153561	3.0	1183	1183	5	0.00	0.00	143666	150417	186831	1.0	689	689	5	0.19	0.00	165217	437637	448184	1.4	915	915
		3	5	0.00	0.00	164389	143388	238411	1.0	1865	1865	5	0.00	0.00	175316	301318	344122	1.0	1875	1875	5	0.00	0.00	181997	752309	770441	1.0	1961	1961
	40	5	5	1.45	0.00	161748	145396	229838	5.4	5888	5888	5	0.22	0.00	193488	293205	339003	1.4	3766	3766	5	0.00	0.00	217868	669644	685705	1.0	2393	2393
		8	5	0.18	0.00	206218	151482	248027	1.8	3701	3701	5	0.68	0.00	229147	333368	372998	4.6	7132	7132	5	0.64	0.00	253639	784714	802304	3.4	5942	5942
		3	5	0.66	0.00	199833	191514	325473	2.6	10746	10746	5	0.00	0.00	226511	432843	484873	1.0	8524	8524	5	0.00	0.00	238077	1116651	1136036	1.0	5822	5822
	50	5	5	0.00	0.00	252649	210940	326184	1.0	6300	6300	5	0.92	0.00	304225	543086	585022	5.0	38525	38525	5	0.00	0.00	274997	1129627	1149945	1.0	9719	9719
		8	5	2.07	0.00	280698	228136	350604	8.6	28322	28322	5	0.16	0.00	325232	473717	521134	3.0	22320	22320	5	0.23	0.00	339318	992768	1012748	2.2	15644	15644
		3	5	5.80	0.00	25924	10010	21877	3.0	30	30	5	0.00	0.00	31284	14225	24232	1.0	10	10	5	0.00	0.00	30044	34182	38556	1.0	8	8
	10	5	5	4.74	0.00	28721	8581	22899	11.4	91	91	5	0.00	0.00	23753	16455	25521	1.0	11	11	5	0.00	0.00	27971	32565	37309	1.0	10	10
		8	5	5.72	0.00	31432	9212	26652	2.6	29	29	5	0.98	0.00	28012	14817	25801	1.8	17	17	5	0.00	0.00	30581	36645	41400	1.0	11	11
		3	5	1.86	0.00	55478	30379	68799	33.4	1181	1181	5	0.00	0.00	58572	57523	72891	1.0	58	58	5	0.00	0.00	57708	111481	118815	1.0	68	68
	20	5	5	0.46	0.00	60484	27556	61312	1.4	163	163	5	0.10	0.00	64425	60580	78177	1.4	102	102	5	0.00	0.00	65979	106174	114168	1.0	77	77
		8	5	0.10	0.00	69041	23115	60760	1.4	153	153	5	0.00	0.00	74298	51454	73626	1.0	92	92	5	0.00	0.00	81107	102965	111459	1.0	97	97
		3	5	2.11	0.00	99644	61726	115696	14.2	2644	2644	5	0.00	0.00	108484	123837	154162	1.0	395	395	5	0.00	0.00	116597	244751	257585	1.0	361	361
4	30	5	5	0.82	0.00	119001	56225	122961	3.8	1060	1060	5	0.83	0.00	128737	117434	151290	5.8	1404	1404	5	0.07	0.00	119060	271332	283641	1.4	594	594
		8	5	1.37	0.00	111942	54514	128604	2.6	960	960	5	0.00	0.00	128667	124470	152778	1.0	595	595	5	0.00	0.00	126767	264008	276513	1.0	573	573
		3	5	1.54	0.00	135516	80549	161611	127.0	52025	52025	5	0.00	0.00	150153	217211	252908	1.0	1552	1552	5	0.08	0.00	148295	442939	458045	1.4	1969	1969
	40	5	5	1.65	0.00	155296	85466	177296	27.0	14109	14109	5	0.54	0.00	166939	183731	224222	3.4	2871	2871	5	0.31	0.00	192863	498616	513377	1.4	1925	1925
		8	5	0.88	0.00	182045	102071	183328	15.4	8007	8007	5	0.47	0.00	174923	223176	258181	2.2	3112	3112	5	0.19	0.00	202286	434238	451530	2.6	3738	3738
		3	4	2.97	0.09	181192	133623	243608	194.6	129257	223450	5	0.00	0.00	210995	305800	352519	1.0	4870	4870	5	0.00	0.00	205983	752872	772932	1.0	3498	3498
	50	5	4	4.07	0.27	213998	149722	269135	91.8	89871	193229	5	0.07	0.00	223584	384810	425908	2.6	7722	7722	5	0.00	0.00	239457	688505	709829	1.0	4446	4446
		8	5	2.00	0.00	206448	136104	272875	81.4	146459	146459	5	0.05	0.00	255551	329084	379091	1.8	7996	7996	5	1.04	0.00	278696	674810	696502	14.6	50830	50830
		3	5	3.50	0.00	21393	6097	15623	3.0	28	28	5	0.00	0.00	27528	8337	16385	1.0	9	9	5	0.00	0.00	22781	17640	21482	1.0	8	8
	10	5	5	2.02	0.00	28468	5948	19006	2.6	18	18	5	0.00	0.00	21555	8478	17657	1.0	9	9	5	0.00	0.00	30976	22232	26349	1.0	9	9
		8	5	2.21	0.00	30085	5659	19576	3.0	20	20	5	0.00	0.00	23129	11028	17981	1.0	9	9	5	0.00	0.00	24755	21933	25380	1.0	10	10
		3	5	3.25	0.00	52211	26801	52348	4.6	204	204	5	0.00	0.00	49578	40624	56853	1.0	56	56	5	0.00	0.00	58345	74257	82172	1.0	50	50
	20	5	5	8.94	0.00	59936	23544	53204	4.2	228	228	5	0.00	0.00	58721	36401	54741	1.0	62	62	5	0.00	0.00	59475	78675	86949	1.0	61	61
		8	5	2.12	0.00	61023	22483	51281	2.2	186	186	5	0.05	0.00	53783	37879	54590	1.4	80	80	5	0.00	0.00	64590	77881	85936	1.0	78	78
		3	5	5.01	0.00	90211	46194	88115	23.4	3281	3281	5	0.56	0.00	100196	83397	109006	11.4	999	999	5	0.00	0.00	98325	171327	182887	1.0	247	247
5	30	5	5	5.29	0.00	92154	37659	95763	17.8	2782	2782	5	0.33	0.00	95893	76211	106589	1.8	425	425	5	0.31	0.00	115966	181639	193431	2.2	480	480
		8	5	1.45	0.00	102383	39702	93958	1.8	876	876	5	1.40	0.00	112524	86342	114052	8.2	1435	1435	5	0.35	0.00	118730	175606	188156	1.8	569	569
		3	4	3.02	0.06	114046	65868	136526	395.8	6239	125096	5	0.01	0.00	127719	148477	182995	1.8	1486	1486	5	0.00	0.00	147043	315466	331318	1.0	1232	1232
	40	5	5	3.18	0.00	138306	70682	153015	23.0	12902	12902	5	1.36	0.00	144298	153934	187908	1.8	2556	2556	5	0.10	0.00	165518	310505	326051	1.8	2227	2227
		8	5	1.92	0.00	139187	77897	156617	9.8	4051	4051	5	1.76	0.00	174045	148347	188159	10.2	6589	6589	5	0.00	0.00	180494	287477	305207	1.0	1620	1620
		3	5	4.64	0.00	154814	97588	204747	170.6	146244	146244	5	0.00	0.00	170013	227159	273319	1.0	3162	3162	5	0.00	0.00	190691	533301	552351	1.0	3284	3284
	50	5	5	3.38	0.00	187699	106936	209773	85.0	54790	54790	5	0.31	0.00	189733	199981	246380	1.4	5264	5264	5	0.00	0.00	217680	517789	538164	1.0	3712	3712
		8	5	1.91	0.00	185065	111222	220206	78.6	78694	78694	5	0.74	0.00	213897	221165	275872	10.2	15287	15287	5	0.08	0.00	225799	469441	489205	1.4	5099	5099
Sum./Avg.			222	2.41	0.01	112710	70637	133851	34.4	18262	25293	**225**	0.27	**0.00**	123927	154570	183089	2.4	3387	3387	**225**	**0.11**	**0.00**	132230	341720	353956	**1.6**	**2911**	**2911**

Table 9: Results for large-scale instances with different dominance relationship.

m	n	f	$\bar{b} \in [0.1, 0.2]$								$\bar{b} \in [0.2, 0.6]$								$\bar{b} \in [0.6, 1.2]$							
			Opt	Gap_{lb}	Gap	TWC	TUC	TC	Nodes	T_{opt}	Time	Opt	Gap_{lb}	Gap	TWC	TUC	TC	Nodes	T_{opt}	Time	Opt	Gap_{lb}	Gap	TWC	TUC	TC	Nodes	T_{opt}	Time
		5	3	2.86	1.23	232108	140969	265023	144.2	45882	268369	5	0.00	0.00	255403	326819	379222	1.0	7423	7423	5	0.34	0.00	287909	680424	706338	2.2	14164	14164
	60	8	5	1.76	0.00	239011	150676	288611	89.0	144055	144055	5	2.35	0.00	274387	332076	387302	37.8	80603	80603	5	0.91	0.00	298281	690770	713717	17.0	62355	62355
		12	5	2.71	0.00	266573	155047	296051	50.2	105766	105766	5	2.12	0.00	341151	339536	394868	11.8	48182	48182	5	0.00	0.00	374740	731073	754678	1.0	13828	13828
		5	4	2.45	0.05	293043	196154	352708	45.4	78896	183385	5	0.76	0.00	327268	441250	500161	9.8	76314	76314	5	0.14	0.00	337870	956536	986528	1.8	25504	25504
	70	8	4	3.55	0.01	294387	197887	358992	67.0	161730	250363	4	1.79	0.07	369178	422669	488476	37.0	52523	162258	5	0.48	0.00	414486	1026817	1055139	1.4	20836	20836
		12	2	3.50	0.24	343016	201902	370614	81.4	69058	389038	5	3.76	0.00	399964	478968	537199	6.6	59147	59147	4	1.44	0.03	414485	916368	944748	26.2	81730	186401
		5	4	2.43	0.14	339726	240065	436900	21.8	29987	144025	4	2.34	0.14	371582	512483	591201	26.2	156080	247157	5	0.00	0.00	428519	1244768	1276191	1.0	42712	42712
5	80	8	3	3.66	1.84	399007	263049	462774	46.2	235178	387295	5	2.20	0.00	430012	541768	616751	2.6	55889	55889	4	0.80	0.00	447401	1141158	1174848	10.2	147192	243900
		12	4	5.37	0.17	413754	259897	476819	36.2	189111	274272	3	3.49	0.18	466229	591530	661919	33.0	251123	397523	4	1.00	0.10	581338	1275142	1306109	16.2	226439	307638
		5	5	3.97	0.00	383609	319960	506224	12.6	189563	189563	5	1.03	0.00	454951	716393	790404	2.2	128553	128553	5	0.66	0.00	457973	1474683	1509449	2.6	103572	103572
	90	8	3	3.20	1.74	437640	310531	507818	30.6	311958	435983	4	2.67	0.42	471860	681317	774066	14.6	193112	279705	5	0.18	0.00	591512	1523768	1561199	1.4	77906	77906
		12	4	4.67	0.52	478193	309392	540994	17.8	218640	298018	4	4.44	0.30	563246	637866	724672	15.8	325352	386917	1	2.37	0.19	709745	1580929	1620164	25.0	560609	610452
		5	5	0.94	0.00	434721	360122	587611	6.2	152111	152111	3	2.23	1.59	551205	832018	928359	8.6	222892	390298	5	0.00	0.00	565434	1884897	1922307	1.0	163923	163923
	100	8	1	5.23	4.48	528892	386776	610724	21.0	67104	516869	3	4.08	1.68	571252	842827	931132	9.8	272579	410233	4	0.72	0.08	636394	1893581	1933806	1.4	147825	257167
		12	0	7.91	5.44	631279	392044	622432	25.8	-	620872	1	5.27	3.06	650150	923451	1019297	9.0	468145	615563	2	1.96	0.63	781313	1888573	1927728	6.6	109304	431208
		5	2	8.46	0.26	195191	97087	199823	367.8	177210	432184	5	1.98	0.00	189470	147348	214908	22.6	30333	30333	5	0.19	0.00	210891	344405	370657	2.2	8165	8165
	60	8	3	7.07	0.65	199535	95434	207148	304.6	130617	319021	5	2.87	0.00	225378	181943	238383	85.8	107083	107083	5	0.53	0.00	249584	361949	385959	4.2	12135	12135
		12	4	5.56	0.01	216533	94323	219310	118.2	93803	195235	5	0.73	0.00	229014	176852	233722	12.6	23399	23399	5	0.93	0.00	262984	327319	352191	11.4	19616	19616
		5	4	5.65	0.38	235096	107655	233901	132.2	90577	192812	5	1.24	0.00	257259	208235	279877	10.2	36563	36563	5	0.14	0.00	268128	458143	486610	3.4	25473	25473
	70	8	2	7.30	1.34	244581	122250	256506	274.2	299417	481025	5	1.68	0.00	252471	244443	304272	8.2	36793	36793	5	1.27	0.00	289588	442803	473426	7.0	40323	40323
		12	5	4.93	0.00	253431	119752	266641	146.6	250789	250789	5	2.10	0.00	283197	247579	316947	37.8	86806	86806	5	0.60	0.00	307331	471458	501115	9.8	48532	48532
		5	3	5.67	0.24	264675	148305	295586	140.2	125009	315658	4	2.15	0.19	285351	256358	338550	26.6	73351	178920	5	0.45	0.00	331816	611772	645865	3.8	42236	42236
8	80	8	1	5.20	1.28	293464	140782	307605	169.8	84382	500127	3	3.22	0.14	312574	304255	377704	67.0	320154	433592	5	1.07	0.00	348312	565391	598923	11.4	95426	95426
		12	4	6.46	0.11	303231	148061	312698	122.6	317258	375116	5	2.80	0.00	340214	299527	371365	17.4	118938	118938	5	2.13	0.00	376311	590862	621301	7.0	95151	95151
		5	0	6.66	4.09	311311	169319	374295	102.2	-	605724	5	0.36	0.00	327350	355127	440913	1.4	56582	56582	5	1.46	0.00	386742	787375	824593	12.2	139854	139854
	90	8	2	6.37	0.73	331604	181720	374499	93.4	157948	424937	5	1.81	0.00	375871	379072	466369	14.2	181742	181742	4	1.42	0.00	429816	834230	871270	15.8	71615	177711
		12	0	5.00	3.03	368351	186072	397666	129.8	-	603300	5	3.85	0.00	407536	378751	476258	17.4	142909	142909	5	1.99	0.00	453494	757341	797673	11.0	230350	230350
		5	1	5.15	2.47	363334	215093	426570	87.8	484470	578820	3	3.23	0.65	385281	414100	515131	24.6	329321	449497	5	1.22	0.00	416675	879654	921547	2.6	201125	201125
	100	8	0	5.62	5.42	416882	213337	469729	82.6	-	606587	3	3.14	0.60	450130	471454	571516	28.6	254850	396785	5	1.02	0.00	502053	991958	1030536	5.0	225212	225212
		12	2	6.23	2.40	415369	222998	456969	61.4	370440	512694	1	4.30	1.41	480996	483312	575598	33.4	333746	563661	5	2.71	0.00	501939	933465	975196	8.2	273132	273132
		5	5	7.40	0.00	171060	70584	161007	59.0	59716	59716	5	1.19	0.00	171231	113872	168462	31.4	14663	14663	5	0.00	0.00	180380	236309	260094	1.0	3364	3364
	60	8	5	7.75	0.00	182187	71599	166576	154.6	141565	141565	5	1.05	0.00	189167	122711	182844	9.4	8108	8108	5	1.07	0.00	217346	255491	277588	17.4	14433	14433
		12	5	6.45	0.00	196998	72186	176087	55.4	49689	49689	5	2.80	0.00	197488	132964	183905	22.6	19761	19761	5	0.75	0.00	227606	256863	279679	2.2	5575	5575
		5	4	8.16	0.05	202266	89430	206918	97.4	156076	245624	5	1.20	0.00	193890	146506	212120	9.0	17545	17545	5	0.44	0.00	217223	327385	354289	3.8	15054	15054
	70	8	3	6.86	0.74	209396	96760	211109	143.0	115728	310552	5	2.47	0.00	225674	156100	224989	43.0	56434	56434	5	0.66	0.00	255986	355048	381982	3.0	20515	20515
		12	5	4.29	0.00	244161	94112	228237	96.6	166625	166625	5	2.38	0.00	248118	175785	237342	47.4	86010	86010	5	1.19	0.00	291541	334580	364313	22.2	47205	47205
		5	3	6.01	0.66	241814	117952	240309	75.8	119286	313545	5	2.15	0.00	253402	199161	272992	71.8	127510	127510	5	0.17	0.00	286220	431788	464094	1.4	22739	22739
10	80	8	4	6.35	0.27	248349	116418	254414	51.4	177008	262038	5	3.11	0.00	259927	202569	278701	38.6	170197	170197	5	1.20	0.00	316342	466122	496113	3.0	33242	33242
		12	3	6.66	0.59	269981	119715	267854	86.6	96588	298944	4	3.79	0.04	298954	217463	292482	77.0	130351	225424	5	1.10	0.00	338284	433141	465926	9.0	86687	86687
		5	1	7.91	0.48	296436	138381	276488	97.8	62492	496965	4	2.39	0.31	270471	266156	345664	44.2	184421	267587	5	0.89	0.00	301375	527681	560315	1.8	45036	45036
	90	8	1	6.45	2.43	323160	138616	293224	139.0	32622	491588	3	2.89	1.00	318856	258438	341877	83.0	121834	314183	4	0.66	0.34	356419	519669	556258	23.4	85604	190016
		12	4	6.27	0.42	328893	147402	326037	111.4	319144	375851	2	4.15	0.29	342390	263533	351635	68.2	113194	410682	5	1.14	0.00	414444	547930	583015	6.2	131954	131954
		5	0	7.31	4.91	315678	148989	365831	112.2	-	602015	4	1.92	0.50	322080	292183	386921	22.2	236661	312131	5	1.05	0.00	389206	658512	695232	1.4	168275	168275
	100	8	1	6.44	3.97	344103	172101	367578	60.2	178611	523172	3	3.75	0.91	360235	293691	389831	28.6	233194	383325	4	3.38	0.01	404707	630177	671590	9.8	169046	256692
		12	1	6.55	2.41	364814	168714	377956	79.0	288288	546068	0	4.68	0.35	408079	316474	411133	54.6	-	605793	3	2.91	0.28	460178	697319	737460	37.8	335191	445513
Sum./Avg.			130	5.48	1.23	312596	175769	342286	98.8	163609.9	347510	185	2.53	0.31	341331	362821	438387	28.5	137508	204638	**209**	**1.00**	**0.04**	384896	776569	808839	**8.3**	**100226**	**126273**

Table 10: Results for BP_2 on small instances with triangular distributions

m	n	f	$\omega = 0.1$					$\omega = 0.3$					$\omega = 0.5$					$\omega = 0.7$					$\omega = 0.9$				
			Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)
3	10	3	5	0	1.0	11	11	5	0	1.0	14	14	5	0	1.0	28	28	5	0	1.4	29	29	5	0	1.0	15	15
3	10	5	5	0	1.4	18	18	5	0	2.2	23	23	5	0	1.0	15	15	5	0	1.8	24	24	5	0	1.4	23	23
3	10	8	5	0	1.0	13	13	5	0	1.0	15	15	5	0	1.0	46	46	5	0	1.8	30	30	5	0	1.0	19	19
3	20	3	5	0	1.8	190	190	5	0	1.8	268	268	5	0	1.8	308	308	5	0	1.0	218	218	5	0	1.4	298	298
3	20	5	5	0	2.6	267	267	5	0	2.6	301	301	5	0	1.0	190	190	5	0	2.6	412	412	5	0	1.4	289	289
3	20	8	5	0	2.6	353	353	5	0	1.8	354	354	5	0	1.4	313	313	5	0	3.8	588	588	5	0	1.4	397	397
3	30	3	5	0	1.8	1357	1357	5	0	3.4	1858	1858	5	0	1.4	1541	1541	5	0	1.4	1803	1803	5	0	1.0	2066	2066
3	30	5	5	0	2.2	1442	1442	5	0	1.4	1790	1790	5	0	9.0	6172	6172	5	0	7.0	4767	4767	5	0	2.2	2974	2974
3	30	8	5	0	1.4	1655	1655	5	0	3.4	2407	2407	5	0	1.8	2171	2171	5	0	4.2	4009	4009	5	0	5.8	5208	5208
3	40	3	5	0	3.4	6663	6663	5	0	1.4	6324	6324	5	0	1.4	8800	8800	5	0	3.0	10387	10387	5	0	3.0	14974	14974
3	40	5	5	0	1.0	4974	4974	5	0	3.0	10152	10152	5	0	2.2	11455	11455	5	0	7.0	26449	26449	5	0	1.4	12516	12516
3	40	8	5	0	15.8	27738	27738	5	0	1.4	7229	7229	5	0	15.4	31616	31616	5	0	5.0	21496	21496	5	0	4.6	17605	17605
3	50	3	5	0	7.0	26781	26781	5	0	1.0	19411	19411	5	0	1.8	31440	31440	5	0	1.8	41542	41542	5	0	9.4	125116	125116
3	50	5	5	0	3.4	35677	35677	5	0	6.6	48431	48431	5	0	4.6	54320	54320	5	0	4.6	70949	70949	5	0	1.0	41415	41415
3	50	8	5	0	5.8	36834	36834	5	0	3.8	39422	39422	5	0	19.8	139522	139522	5	0	2.2	45197	45197	5	0	1.4	50169	50169
4	10	3	5	0	1.0	17	17	5	0	1.0	10	10	5	0	1.8	12	12	5	0	1.0	22	22	5	0	1.0	19	19
4	10	5	5	0	1.0	19	19	5	0	1.0	10	10	5	0	1.0	71	71	5	0	1.0	18	18	5	0	1.0	21	21
4	10	8	5	0	1.0	18	18	5	0	1.4	15	15	5	0	1.0	13	13	5	0	1.4	20	20	5	0	1.0	40	40
4	20	3	5	0	1.8	104	104	5	0	1.4	100	100	5	0	2.6	313	313	5	0	2.6	191	191	5	0	1.4	158	158
4	20	5	5	0	5.8	269	269	5	0	1.4	132	132	5	0	1.0	108	108	5	0	3.0	255	255	5	0	1.0	150	150
4	20	8	5	0	1.8	151	151	5	0	1.4	155	155	5	0	2.2	218	218	5	0	2.6	283	283	5	0	1.0	196	196
4	30	3	5	0	1.0	450	450	5	0	4.6	1526	1526	5	0	4.6	1753	1753	5	0	4.2	1848	1848	5	0	1.8	1225	1225
4	30	5	5	0	3.4	1118	1118	5	0	3.8	1183	1183	5	0	3.4	1563	1563	5	0	2.6	1442	1442	5	0	1.0	1137	1137
4	30	8	5	0	4.2	1515	1515	5	0	3.0	1377	1377	5	0	8.2	3114	3114	5	0	5.0	2230	2230	5	0	2.2	1774	1774
4	40	3	5	0	5.8	4463	4463	5	0	1.8	3367	3367	5	0	2.6	4009	4009	5	0	4.2	7179	7179	5	0	1.8	5261	5261
4	40	5	5	0	9.8	6633	6633	5	0	5.4	6520	6520	5	0	3.8	6237	6237	5	0	1.4	5048	5048	5	0	1.8	5949	5949
4	40	8	5	0	1.8	3460	3460	5	0	12.2	12371	12371	5	0	9.0	10947	10947	5	0	6.2	10354	10354	5	0	2.6	7488	7488
4	50	3	5	0	2.2	6331	6331	5	0	3.4	12795	12795	5	0	2.2	16778	16778	5	0	3.4	21531	21531	5	0	1.8	15075	15075
4	50	5	5	0	49.0	80543	80543	5	0	3.8	13993	13993	5	0	5.8	24727	24727	5	0	1.4	14938	14938	5	0	5.8	33364	33364
4	50	8	5	0	4.6	15763	15763	5	0	30.6	76575	76575	5	0	2.2	16258	16258	5	0	3.8	22276	22276	5	0	35.0	107898	107898
5	10	3	5	0	1.0	17	17	5	0	1.0	20	20	5	0	1.0	31	31	5	0	1.4	21	21	5	0	1.4	17	17
5	10	5	5	0	1.0	16	16	5	0	1.0	29	29	5	0	1.0	53	53	5	0	1.0	35	35	5	0	1.0	20	20
5	10	8	5	0	1.0	19	19	5	0	1.0	31	31	5	0	2.6	47	47	5	0	1.4	23	23	5	0	1.0	30	30
5	20	3	5	0	3.0	106	106	5	0	1.8	92	92	5	0	1.4	105	105	5	0	2.2	128	128	5	0	2.2	111	111
5	20	5	5	0	3.4	139	139	5	0	1.0	90	90	5	0	1.0	65	65	5	0	2.6	129	129	5	0	3.8	238	238
5	20	8	5	0	1.0	78	78	5	0	1.0	87	87	5	0	5.8	347	347	5	0	1.0	107	107	5	0	1.8	150	150
5	30	3	5	0	3.4	588	588	5	0	12.2	1548	1548	5	0	4.2	947	947	5	0	1.0	556	556	5	0	2.2	665	665
5	30	5	5	0	3.8	741	741	5	0	3.8	960	960	5	0	3.0	926	926	5	0	1.4	670	670	5	0	3.8	1502	1502
5	30	8	5	0	6.2	1383	1383	5	0	5.0	1185	1185	5	0	6.6	1679	1679	5	0	9.4	2250	2250	5	0	9.0	2730	2730
5	40	3	5	0	5.8	2600	2600	5	0	2.2	2071	2071	5	0	3.0	2512	2512	5	0	5.0	4474	4474	5	0	1.8	3010	3010
5	40	5	5	0	5.4	3643	3643	5	0	23.0	11404	11404	5	0	3.4	4048	4048	5	0	3.8	4361	4361	5	0	4.6	5007	5007
5	40	8	5	0	1.0	1629	1629	5	0	1.8	2687	2687	5	0	5.4	5013	5013	5	0	3.4	4451	4451	5	0	5.4	6963	6963
5	50	3	5	0	12.6	11723	11723	5	0	14.6	20388	20388	5	0	2.2	6819	6819	5	0	3.8	11558	11558	5	0	1.0	6629	6629
5	50	5	5	0	2.2	5200	5200	5	0	7.8	13503	13503	5	0	5.8	12797	12797	5	0	4.2	12974	12974	5	0	8.6	24967	24967
5	50	8	5	0	47.4	49413	49413	5	0	10.6	18261	18261	5	0	8.2	16548	16548	5	0	1.4	8379	8379	5	0	18.2	38177	38177
Sum./Avg.			**225**	0	5.4	7603	7603	**225**	0	4.4	**7566**	**7566**	**225**	0	3.8	9466	9466	**225**	0	**3.0**	8126	8126	**225**	0	3.6	12068	12068

Table 11: Results for BP_2 on large instances with triangular distributions

m	n	f	$\omega = 0.1$					$\omega = 0.3$					$\omega = 0.5$					$\omega = 0.7$					$\omega = 0.9$				
			Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)	Opt	Gap(%)	Nodes	$T_{opt}(ms)$	Time(ms)
5	60	5	5	0.00	13.4	34353	34353	5	0.00	30.2	94905	94905	5	0.00	6.6	35080	35080	5	0.00	17.4	79680	79680	5	0.00	6.2	39516	39516
5	60	8	5	0.00	13.8	41135	41135	5	0.00	5.8	25800	25800	5	0.00	47.8	136811	136811	5	0.00	17.8	80536	80536	5	0.00	7.0	60381	60381
5	60	12	5	0.00	21.4	71540	71540	5	0.00	11.4	47929	47929	5	0.00	13.4	65848	65848	5	0.00	26.2	131399	131399	5	0.00	17.8	103704	103704
5	70	5	4	0.02	61.4	131334	226016	5	0.00	18.6	114733	114733	4	0.00	29.8	225432	300811	5	0.00	6.2	92101	92101	5	0.00	7.0	102073	102073
5	70	8	4	0.23	31.8	41502	153989	4	0.11	51.0	231009	305271	3	0.05	41.0	50633	273661	5	0.00	5.8	116168	116168	2	0.17	37.4	123782	416131
5	70	12	4	0.10	47.8	203929	284881	5	0.00	21.4	172876	172876	5	0.00	16.6	211752	211752	5	0.00	30.6	286110	286110	4	0.04	15.4	119186	218170
5	80	5	3	0.32	32.2	68216	284671	2	0.56	40.6	84616	402906	4	0.00	7.8	98032	199290	4	0.24	11.0	152190	243567	3	0.08	11.4	148368	335325
5	80	8	5	0.00	15.8	185834	185834	2	0.16	41.8	444477	545264	4	0.12	12.2	86369	192848	4	0.28	13.0	197344	281394	4	0.44	12.2	227849	305147
5	80	12	2	0.68	42.2	276529	478543	2	0.46	32.6	212300	454092	3	0.24	25.8	274010	409758	4	0.08	15.4	230819	308139	3	0.39	12.2	226522	382028
5	90	5	4	0.42	13.8	217951	299618	4	0.19	10.6	254715	327700	2	0.38	17.8	166868	437507	4	0.49	8.6	384811	431829	4	0.78	5.8	265639	334056
5	90	8	2	3.07	27.4	293045	481585	2	0.50	19.8	297249	486102	2	0.74	13.8	177675	439895	4	0.49	8.2	346254	400885	0	1.51	15.4	-	613528
5	90	12	2	1.10	19.8	166545	436937	3	0.08	14.6	275936	406166	1	0.72	13.8	259959	547478	2	1.54	10.2	316910	494171	1	1.87	14.2	586007	606154
5	100	5	3	2.04	12.2	202848	372095	1	0.89	15.4	347212	565918	0	1.26	10.2	-	621478	3	0.57	3.8	315543	439083	1	1.25	7.8	586665	614180
5	100	8	1	4.50	19.8	172480	525314	1	2.49	13.8	264790	550727	2	1.07	7.4	424492	542842	1	0.98	7.4	212082	536243	1	2.68	7.8	620360	617099
5	100	12	1	5.16	14.2	216023	539892	1	4.20	11.8	252111	544894	0	3.89	13.0	-	617087	0	3.83	9.4	-	617552	0	3.15	9.8	-	616740
8	60	5	5	0.00	33.8	27850	27850	5	0.00	35.4	32932	32932	5	0.00	29.0	32447	32447	5	0.00	32.2	39515	39515	5	0.00	10.6	18241	18241
8	60	8	5	0.00	39.4	35084	35084	5	0.00	39.0	44110	44110	5	0.00	25.4	31585	31585	5	0.00	12.2	21184	21184	5	0.00	44.2	62395	62395
8	60	12	5	0.00	118.2	111453	111453	5	0.00	26.6	33679	33679	5	0.00	26.6	38573	38573	5	0.00	28.6	47340	47340	5	0.00	21.8	44529	44529
8	70	5	5	0.00	9.4	21514	21514	5	0.00	89.4	142832	142832	5	0.00	35.8	83125	83125	5	0.00	27.0	71611	71611	5	0.00	25.0	66362	66362
8	70	8	4	0.07	95.0	42713	154191	5	0.00	64.6	135435	135435	5	0.00	19.0	45431	45431	5	0.00	19.4	60199	60199	5	0.00	10.6	43152	43152
8	70	12	5	0.00	153.4	246592	246592	5	0.00	14.6	47983	47983	5	0.00	28.6	79431	79431	5	0.00	17.0	52885	52885	5	0.00	27.4	89298	89298
8	80	5	4	0.00	167.0	309291	367740	4	0.02	81.4	114833	212511	5	0.00	28.6	106313	106313	5	0.00	18.6	114909	114909	5	0.00	44.6	198360	198360
8	80	8	5	0.00	118.6	282111	282111	3	0.42	121.0	217743	371950	3	0.09	89.0	95751	298526	5	0.00	40.2	182424	182424	5	0.00	62.6	309415	309415
8	80	12	4	0.01	86.2	152186	242752	4	0.26	77.4	189588	271891	5	0.00	74.6	342644	342644	4	0.02	79.8	314584	372218	4	0.02	76.2	262139	330808
8	90	5	3	1.14	81.0	115387	310625	2	0.97	113.4	313093	487538	2	0.50	77.0	105223	405229	3	0.18	32.6	84467	291810	4	0.02	39.0	235028	309083
8	90	8	3	0.54	90.2	203604	362704	1	0.98	104.6	425825	569543	5	0.00	11.4	98597	98597	4	0.46	21.4	104116	204669	5	0.00	24.6	260339	260339
8	90	12	3	0.39	57.0	103273	302742	2	0.75	76.2	214201	449521	3	0.14	58.2	340038	447708	3	0.35	35.4	154454	334386	3	0.68	31.4	210360	370840
8	100	5	0	2.43	95.8	-	607287	1	1.14	58.6	61312	494885	3	1.30	40.6	333881	441258	2	0.54	28.6	155573	433068	3	1.58	22.2	223519	376768
8	100	8	1	4.91	79.0	547398	596287	2	1.13	58.6	330735	498750	1	0.77	47.8	111083	513163	3	0.82	24.6	230162	384206	4	0.27	17.4	267024	334721
8	100	12	2	0.56	55.8	169063	435292	2	0.59	49.4	337596	506980	4	0.34	20.6	228340	305543	3	1.18	20.6	248945	394352	0	0.51	32.6	-	607148
10	60	5	5	0.00	53.0	29464	29464	5	0.00	26.6	20100	20100	5	0.00	10.2	12083	12083	5	0.00	5.8	7702	7702	5	0.00	25.4	25009	25009
10	60	8	5	0.00	33.0	23377	23377	5	0.00	13.8	16029	16029	5	0.00	12.6	16658	16658	5	0.00	15.8	20359	20359	5	0.00	5.0	11488	11488
10	60	12	5	0.00	39.0	31193	31193	5	0.00	28.6	29929	29929	5	0.00	23.8	29218	29218	5	0.00	1.8	6283	6283	5	0.00	23.0	30251	30251
10	70	5	5	0.00	140.2	135899	135899	4	0.13	143.4	35964	149009	5	0.00	67.8	86191	86191	5	0.00	8.2	20215	20215	5	0.00	30.6	57596	57596
10	70	8	5	0.00	110.2	119681	119681	5	0.00	67.0	89515	89515	5	0.00	51.8	85548	85548	5	0.00	30.6	65824	65824	5	0.00	40.6	74309	74309
10	70	12	5	0.00	113.8	144066	144066	5	0.00	127.4	176425	176425	4	0.01	97.8	59296	167743	5	0.00	37.4	79832	79832	5	0.00	42.2	84033	84033
10	80	5	5	0.00	117.8	184786	184786	4	0.25	179.0	261315	329567	5	0.00	92.6	211460	211460	5	0.00	21.4	68959	68959	5	0.00	18.2	65491	65491
10	80	8	4	0.00	242.2	344983	396708	5	0.00	111.0	218661	218661	4	0.05	90.6	112754	210285	5	0.00	60.6	170462	170462	5	0.00	21.8	80376	80376
10	80	12	3	0.33	159.4	51059	271254	5	0.00	66.6	166680	166680	5	0.00	31.4	84675	84675	4	0.00	58.6	71651	177537	5	0.00	51.8	188377	188377
10	90	5	3	1.11	185.4	304776	423663	1	0.48	175.0	21079	486051	4	0.15	49.4	101348	201505	4	0.07	104.2	335561	389441	5	0.00	47.8	240935	240935
10	90	8	2	1.48	157.8	232247	453585	2	0.90	122.2	138201	417355	4	0.25	59.4	170236	257500	2	0.20	85.8	192154	440348	4	0.22	57.0	264855	333866
10	90	12	3	0.49	143.4	315182	429806	3	0.14	128.6	351199	451775	4	0.29	69.0	233263	307392	5	0.00	52.2	295109	295109	3	0.10	62.6	207240	365327
10	100	5	2	0.33	142.2	299341	482233	2	1.07	108.6	305105	484891	4	0.36	44.6	218844	296500	3	0.16	46.6	101113	303662	4	0.08	41.0	257534	328378
10	100	8	4	0.08	87.8	312671	370745	1	0.66	89.0	39492	493873	2	0.74	57.8	85769	399624	1	1.76	77.0	180063	521382	3	0.40	26.2	108863	309318
10	100	12	1	1.07	94.2	93945	503320	1	1.20	109.4	591502	605593	1	1.00	74.2	215235	527426	3	0.15	59.0	341528	448222	5	0.00	36.6	397111	397111
Sum./Avg.			161	0.72	77.5	166215	278231	151	0.46	63.2	182750	299584	168	0.32	38.3	**139721**	248790	**180**	**0.32**	28.8	154117	**234644**	175	0.36	**26.8**	180802	252835