Electronic Companion—"A Branch-Price-and-Cut Algorithm for the Vehicle Routing Problem with Release and Due Dates"

EC.1. Detailed results for the instances of class A by CG_b, CG_n and CG_h

In section 4.2, we have reported the aggregated results of the linear relaxation by CG_b, CG_n and CG_h. In this section, the corresponding detailed results are presented in Tables EC.1-EC.20. Each name of instance gives the number of vertices including the depot and the number of available vehicles. The subscript 1 (or 2, 3, 4, 5) indicates that the instance is generated by using parameter $\theta = 0.05$ (or 0.10, 0.15, 0.20, 0.25). For example, the instance '$A-n32-k5_1$' has 31 customers and 5 available vehicles. The instance is generated by using parameter $\theta = 0.05$. The columns have the same meaning as in Table 3.

Table EC. 1: Detailed results for the instances of class A with $\theta = 0.05$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_1$	1138.50	1127.17	1127.17	24	1.1	0.00	20	1.2	21	1.8
$A-n33-k5_1$	827.50	813.75	813.75	26	1.6	0.00	24	2.6	25	2.7
$A-n33-k6_1$	904.50	896.21	896.21	18	0.9	0.00	21	1.7	19	1.3
$A-n34-k5_1$	915.00	893.89	893.76	28	2.4	-0.65	28	5.6	27	12.3
$A-n36-k5_1$	1081.00	1051.30	1051.30	27	1.8	0.00	25	3.6	27	11.9
$A-n37-k5_1$	839.00	813.38	813.38	28	2.5	0.00	29	5.2	26	6.4
$A-n37-k6_1$	1251.50	1228.80	1226.00	31	2.7	-12.33	30	5.8	29	16.9
$A-n38-k5_1$	894.00	851.53	851.53	49	17.7	0.00	51	273.4	58	2184.2
$A-n39-k5_1$	1018.50	1004.50	1004.50	39	11.3	0.00	33	20.6	28	66.0
$A-n39-k6_1$	1071.50	1071.50	1071.50	24	1.8	–	25	2.8	24	6.3
$A-n44-k6_1$	1147.00	1141.48	1140.90	36	8.8	-10.51	36	22.1	30	134.1
$A-n45-k6_1$	1122.00	–	1103.77	61	67.6	–	55	751.5	–	–
$A-n45-k7_1$	1636.00	1617.88	1617.88	25	2.1	0.00	25	3.8	25	19.6
$A-n46-k7_1$	1214.50	1201.06	1201.06	26	1.4	0.00	27	2.5	26	2.9
$A-n48-k7_1$	1406.00	1384.30	1384.30	26	3.0	0.00	27	5.2	30	31.9
$A-n53-k7_1$	1325.50	–	1302.22	48	36.2	–	43	284.6	–	–
$A-n54-k7_1$	1532.00	1511.72	1511.56	44	14.1	-0.79	40	29.5	39	1031.1
$A-n55-k9_1$	1344.50	1318.11	1317.96	36	2.6	-0.57	31	3.4	34	7.1
$A-n60-k9_1$	1731.00	1699.27	1698.61	45	5.7	-2.08	42	9.3	39	54.1
$A-n61-k9_1$	1178.50	–	1151.30	61	63.5	–	49	227.0	–	–
$A-n62-k8_1$	1684.00	–	1664.17	55	28.7	–	53	57.4	–	–
$A-n63-k9_1$	2234.50	–	2203.38	60	48.2	–	51	1406.4	–	–
$A-n63-k10_1$	1741.00	1714.65	1714.65	43	7.2	0.00	40	10.5	42	40.0
$A-n64-k9_1$	1854.00	1818.20	1818.20	48	11.8	0.00	43	16.4	46	585.6
$A-n65-k9_1$	1360.00	–	1335.38	52	58.5	–	67	469.1	–	–
$A-n69-k9_1$	–	–	1369.55	71	41.2	–	68	125.6	–	–
$A-n80-k10_1$	–	–	2314.03	58	82.4	–	61	154.8	–	–

Table EC. 2: Detailed results for the instances of class A with $\theta = 0.10$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_2$	1111.00	1111.00	1111.00	19	0.9	–	18	1.3	17	1.0
$A-n33-k5_2$	849.50	825.83	825.83	18	1.1	0.00	21	1.8	20	1.9
$A-n33-k6_2$	966.00	950.55	950.55	19	0.9	0.00	18	1.5	18	1.4
$A-n34-k5_2$	890.00	862.43	862.41	23	1.7	-0.08	25	3.2	23	4.9
$A-n36-k5_2$	1125.50	1099.01	1098.07	34	3.2	-3.55	31	5.0	27	21.7
$A-n37-k5_2$	860.50	831.25	831.25	28	2.5	0.00	29	3.8	30	4.1
$A-n37-k6_2$	1244.00	1217.64	1215.46	37	3.8	-8.27	29	8.1	42	31.6
$A-n38-k5_2$	888.00	851.69	851.34	49	19.8	-0.96	53	310.9	62	2697.9
$A-n39-k5_2$	1034.50	1021.09	1020.71	62	33.7	-2.83	53	572.5	34	418.2
$A-n39-k6_2$	1123.00	1117.25	1117.25	29	2.2	0.00	27	2.9	31	5.6
$A-n44-k6_2$	1177.00	1171.13	1170.29	29	7.1	-14.31	33	17.2	26	67.7
$A-n45-k6_2$	1108.00	–	1098.33	62	40.5	–	62	1248.8	–	–
$A-n45-k7_2$	1644.00	1626.08	1626.08	28	2.4	0.00	28	3.7	32	53.8
$A-n46-k7_2$	1211.00	1197.50	1197.50	27	1.3	0.00	26	1.9	25	1.9
$A-n48-k7_2$	1492.50	1465.00	1465.00	29	3.8	0.00	26	7.4	30	64.7
$A-n53-k7_2$	1360.00	1330.36	1330.17	45	19.2	-0.64	41	72.3	51	1263.8
$A-n54-k7_2$	1596.00	1568.61	1568.46	46	27.1	-0.55	43	55.8	46	2052.1
$A-n55-k9_2$	1387.50	1364.23	1364.23	35	3.1	0.00	37	4.8	40	5.3
$A-n60-k9_2$	1770.00	1733.40	1731.66	33	4.9	-4.75	30	6.2	34	48.5
$A-n61-k9_2$	1217.50	–	1174.13	59	50.6	–	51	331.3	–	–
$A-n62-k8_2$	1765.50	–	1757.05	57	36.8	–	52	49.5	–	–
$A-n63-k9_2$	2317.50	–	2285.87	46	32.9	–	40	378.7	–	–
$A-n63-k10_2$	1769.00	1735.13	1735.13	38	6.3	0.00	37	10.3	32	41.5
$A-n64-k9_2$	1937.00	1904.07	1904.07	46	13.9	0.00	45	29.4	48	545.1
$A-n65-k9_2$	1429.50	–	1402.72	78	92.1	–	85	1975.5	–	–
$A-n69-k9_2$	1420.50	–	1377.69	66	35.1	–	66	63.3	–	–
$A-n80-k10_2$	–	–	2401.32	57	66.3	–	63	138.2	–	–

Table EC. 3: Detailed results for the instances of class A with $\theta = 0.15$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_3$	1139.50	1136.63	1136.63	27	1.2	0.00	17	1.1	24	2.2
$A-n33-k5_3$	828.00	807.42	807.42	21	1.4	0.00	26	3.1	24	2.5
$A-n33-k6_3$	936.00	930.00	930.00	26	1.2	0.00	22	1.8	22	1.7
$A-n34-k5_3$	951.50	936.81	936.21	26	2.5	-4.08	29	6.6	35	12.4
$A-n36-k5_3$	1115.50	1095.07	1094.75	31	2.3	-1.57	28	4.5	30	17.8
$A-n37-k5_3$	879.50	847.88	847.87	38	5.4	-0.01	31	7.2	33	36.2
$A-n37-k6_3$	1320.50	1300.17	1300.17	33	3.3	0.00	26	9.3	40	25.5
$A-n38-k5_3$	895.50	848.11	848.11	62	29.7	0.00	63	485.6	57	1521.8
$A-n39-k5_3$	1090.00	1072.52	1072.52	41	18.3	0.00	43	85.3	29	160.1
$A-n39-k6_3$	1158.00	1158.00	1158.00	25	2.3	–	22	2.9	20	3.2
$A-n44-k6_3$	1195.50	1181.44	1180.94	30	6.4	-3.56	27	13.2	25	31.5
$A-n45-k6_3$	1154.00	–	1134.75	58	61.4	–	57	792.3	–	–
$A-n45-k7_3$	1633.00	1614.17	1614.17	27	3.4	0.00	28	9.2	28	56.8
$A-n46-k7_3$	1245.00	1238.33	1238.33	33	1.7	0.00	32	2.8	28	2.6
$A-n48-k7_3$	1483.50	1468.75	1468.75	34	4.2	0.00	33	6.9	38	38.8
$A-n53-k7_3$	1381.50	–	1350.21	47	26.0	–	50	225.1	–	–
$A-n54-k7_3$	1595.00	1575.69	1575.56	46	41.6	-0.67	46	136.2	43	3093.0
$A-n55-k9_3$	1444.50	1418.48	1418.25	32	2.8	-0.88	32	5.3	35	6.1
$A-n60-k9_3$	1762.00	1723.09	1723.09	40	6.9	0.00	43	12.1	39	80.0
$A-n61-k9_3$	1254.50	–	1216.06	51	58.1	–	48	202.5	–	–
$A-n62-k8_3$	1746.00	–	1730.78	54	38.7	–	59	60.4	–	–
$A-n63-k9_3$	2474.50	–	2434.97	35	38.4	–	38	89.1	–	–
$A-n63-k10_3$	1800.00	1778.74	1778.74	52	13.4	0.00	45	22.0	46	172.4
$A-n64-k9_3$	2005.50	1973.66	1973.66	47	16.2	0.00	47	30.0	46	1417.4
$A-n65-k9_3$	1449.50	–	1421.83	81	116.9	–	91	1624.7	–	–
$A-n69-k9_3$	1406.00	–	1380.82	77	57.3	–	70	254.3	–	–
$A-n80-k10_3$	–	–	2488.87	47	151.9	–	50	132.4	–	–

Table EC. 4: Detailed results for the instances of class A with $\theta = 0.20$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_4$	1188.00	1185.83	1185.83	20	1.0	0.00	19	1.7	23	1.8
$A-n33-k5_4$	887.50	876.08	876.08	21	1.5	0.00	23	2.8	20	3.2
$A-n33-k6_4$	965.00	955.60	955.60	19	1.0	0.00	19	1.8	18	1.4
$A-n34-k5_4$	927.00	903.21	903.19	22	2.8	-0.07	23	3.5	19	4.8
$A-n36-k5_4$	1079.00	1055.58	1055.58	29	3.1	0.00	34	4.9	29	12.9
$A-n37-k5_4$	875.00	838.80	838.80	27	3.3	0.00	28	7.9	24	6.3
$A-n37-k6_4$	1319.50	1293.89	1293.11	34	3.6	-3.05	30	10.8	36	26.5
$A-n38-k5_4$	995.00	962.55	962.49	53	26.0	-0.18	55	371.5	56	1270.1
$A-n39-k5_4$	1181.50	1156.38	1156.15	30	15.2	-0.92	37	78.8	26	201.1
$A-n39-k6_4$	1156.50	1156.50	1156.50	32	2.0	–	31	3.5	26	6.2
$A-n44-k6_4$	1200.50	1182.77	1182.77	33	6.5	0.00	27	12.0	28	45.2
$A-n45-k6_4$	1184.50	–	1160.67	66	80.8	–	55	1108.1	–	–
$A-n45-k7_4$	1747.50	1732.37	1732.37	29	3.1	0.00	28	7.5	28	23.1
$A-n46-k7_4$	1255.00	1252.35	1252.35	27	1.6	0.00	25	2.7	23	2.4
$A-n48-k7_4$	1516.50	1496.42	1496.42	31	4.4	0.00	35	7.7	33	38.1
$A-n53-k7_4$	1405.00	1377.15	1376.97	49	33.3	-0.65	45	75.2	50	1775.3
$A-n54-k7_4$	–	1610.87	1610.55	40	33.2	–	39	45.7	37	1364.0
$A-n55-k9_4$	1436.50	1413.69	1413.69	43	4.8	0.00	40	13.5	52	73.4
$A-n60-k9_4$	1786.00	1759.61	1758.60	42	6.2	-3.83	47	8.9	43	48.7
$A-n61-k9_4$	–	–	1257.79	55	53.7	–	48	638.7	–	–
$A-n62-k8_4$	1870.50	–	1842.07	48	66.2	–	40	78.9	–	–
$A-n63-k9_4$	2384.50	–	2370.99	49	60.3	–	48	1856.5	–	–
$A-n63-k10_4$	1833.50	1811.28	1811.28	35	5.4	0.00	35	13.5	33	110.8
$A-n64-k9_4$	2072.50	2036.23	2035.84	43	17.4	-1.08	48	34.3	46	1222.4
$A-n65-k9_4$	1502.50	–	1472.94	79	206.0	–	75	1670.0	–	–
$A-n69-k9_4$	1506.00	–	1479.77	71	68.3	–	70	273.1	–	–
$A-n80-k10_4$	2539.50	–	2504.54	49	158.7	–	56	283.3	–	–

Table EC. 5: Detailed results for the instances of class A with $\theta = 0.25$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_5$	1177.50	1156.60	1156.60	23	1.3	0.00	23	3.0	20	1.8
$A-n33-k5_5$	945.00	921.65	921.65	22	1.3	0.00	24	4.1	22	4.1
$A-n33-k6_5$	951.00	941.36	941.36	20	1.1	0.00	19	1.8	19	1.8
$A-n34-k5_5$	956.00	925.62	925.62	26	2.9	0.00	23	7.0	21	9.0
$A-n36-k5_5$	1156.50	1138.25	1138.25	25	2.8	0.00	27	4.2	25	17.6
$A-n37-k5_5$	854.00	832.00	832.00	31	3.5	0.00	30	5.6	33	6.1
$A-n37-k6_5$	1370.00	1336.13	1335.12	28	3.4	-2.98	29	12.4	34	28.8
$A-n38-k5_5$	969.00	924.67	922.33	61	40.8	-5.27	66	546.6	66	1599.8
$A-n39-k5_5$	1134.00	1107.19	1107.12	36	18.1	-0.26	32	64.4	27	141.3
$A-n39-k6_5$	1192.50	1192.50	1192.50	28	2.7	0.00	27	4.4	22	8.0
$A-n44-k6_5$	1209.00	1197.51	1195.63	33	8.4	-16.36	35	25.7	27	59.9
$A-n45-k6_5$	1185.00	–	1149.25	62	63.2	–	61	1624.9	–	–
$A-n45-k7_5$	1779.50	1755.04	1755.04	25	3.5	0.00	25	8.9	25	64.5
$A-n46-k7_5$	1326.00	1307.67	1307.67	28	1.6	0.00	32	2.7	31	3.6
$A-n48-k7_5$	1530.00	1509.21	1509.21	31	4.7	0.00	37	10.3	35	239.3
$A-n53-k7_5$	1438.50	–	1402.72	46	41.3	–	44	500.4	–	–
$A-n54-k7_5$	1706.00	1671.41	1670.89	43	45.3	-1.50	37	72.0	38	2437.0
$A-n55-k9_5$	1462.50	1432.66	1432.66	44	4.0	0.00	40	5.1	44	8.7
$A-n60-k9_5$	1873.50	1839.19	1838.45	38	8.0	-2.16	38	10.3	32	112.3
$A-n61-k9_5$	–	–	1274.86	51	63.0	–	44	317.4	–	–
$A-n62-k8_5$	1857.00	–	1832.64	52	55.9	–	43	70.0	–	–
$A-n63-k9_5$	2558.50	–	2533.70	50	60.9	–	45	489.7	–	–
$A-n63-k10_5$	1877.50	1849.63	1849.63	33	6.0	0.00	40	9.6	35	58.3
$A-n64-k9_5$	2104.00	2077.83	2077.46	48	15.9	-1.41	48	31.1	39	554.1
$A-n65-k9_5$	1521.50	–	1519.32	73	163.1	–	81	2336.9	–	–
$A-n69-k9_5$	1529.50	–	1503.68	52	50.4	–	55	86.7	–	–
$A-n80-k10_5$	–	–	2657.40	61	207.1	–	56	300.0	–	–

Table EC. 6: Detailed results for the instances of class B with $\theta = 0.05$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_1$	1218.50	1207.00	1206.83	35	3.0	-1.48	32	3.6	34	16.1
$B-n34-k5_1$	1252.00	1237.17	1232.71	28	6.9	-30.07	28	9.4	29	42.2
$B-n35-k5_1$	1831.00	1661.93	1661.93	35	2.1	0.00	34	3.5	39	11.4
$B-n38-k6_1$	1298.00	1241.92	1241.92	33	2.3	0.00	34	2.8	28	2.0
$B-n39-k5_1$	990.50	950.86	950.67	41	10.9	-0.47	44	14.7	38	190.0
$B-n41-k6_1$	1317.00	1251.81	1251.81	43	11.6	0.00	43	28.2	46	200.7
$B-n43-k6_1$	1058.00	1038.53	1038.29	44	7.4	-1.23	43	9.1	42	60.8
$B-n44-k7_1$	1526.50	1446.03	1446.03	30	3.9	0.00	30	4.3	25	7.9
$B-n45-k5_1$	927.00	–	848.05	83	357.4	–	103	2453.7	–	–
$B-n45-k6_1$	966.50	–	938.34	58	98.6	–	63	826.8	–	–
$B-n50-k7_1$	1098.50	1012.53	1010.81	28	3.1	-2.00	34	6.3	28	4.7
$B-n50-k8_1$	1951.00	1915.97	1915.34	38	9.9	-1.80	32	15.2	35	221.5
$B-n51-k7_1$	–	–	1473.83	64	189.4	–	58	315.5	–	–
$B-n52-k7_1$	1367.50	1307.15	1306.93	69	53.1	-0.36	59	42.4	69	1408.2
$B-n56-k7_1$	1286.50	1203.97	1203.60	56	20.6	-0.45	62	29.3	62	251.8
$B-n57-k7_1$	2046.00	–	1999.01	98	1261.2	–	62	2931.1	–	–
$B-n57-k9_1$	3038.00	2999.46	2998.59	40	4.1	-2.26	36	4.8	36	17.3
$B-n63-k10_1$	2725.00	2684.03	2681.69	48	12.4	-5.71	53	20.1	49	808.4
$B-n64-k9_1$	–	–	1116.70	72	505.9	–	53	746.9	–	–
$B-n66-k9_1$	2177.50	–	2140.14	65	111.5	–	66	171.8	–	–
$B-n67-k10_1$	–	1353.86	1353.84	52	8.1	0.00	54	12.9	54	69.2
$B-n68-k9_1$	2244.50	–	2175.99	63	61.2	–	60	52.9	–	–
$B-n78-k10_1$	–	–	1920.21	85	80.8	–	82	124.0	–	–

Table EC. 7: Detailed results for the instances of class B with $\theta = 0.10$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_2$	1243.00	1238.25	1238.20	27	2.1	-1.05	24	2.4	34	10.4
$B-n34-k5_2$	1276.50	1260.23	1250.57	34	9.1	-59.37	29	11.1	32	42.0
$B-n35-k5_2$	1803.00	1640.71	1640.71	31	2.4	0.00	35	5.7	35	8.6
$B-n38-k6_2$	1303.00	1257.28	1257.28	34	1.9	0.00	29	2.0	34	2.8
$B-n39-k5_2$	1027.00	985.64	985.64	35	18.6	0.00	38	14.5	31	413.5
$B-n41-k6_2$	1271.50	1258.55	1258.52	40	11.4	-0.23	40	64.2	49	343.2
$B-n43-k6_2$	1088.50	1057.25	1056.46	32	6.7	-2.53	39	10.6	34	79.2
$B-n44-k7_2$	1583.00	1500.35	1500.35	27	3.4	0.00	31	5.1	32	12.3
$B-n45-k5_2$	917.00	–	843.00	86	649.8	–	–	–	–	–
$B-n45-k6_2$	1024.00	–	994.22	58	110.0	–	52	660.3	–	–
$B-n50-k7_2$	1121.50	1047.07	1047.07	27	3.0	0.00	29	4.1	27	4.1
$B-n50-k8_2$	1978.50	1945.73	1945.60	33	11.2	-0.40	27	11.1	32	309.1
$B-n51-k7_2$	1612.00	1508.29	1506.47	60	232.0	-1.75	58	300.9	65	2986.5
$B-n52-k7_2$	1364.00	1312.05	1310.88	65	125.3	-2.25	54	60.3	56	1603.5
$B-n56-k7_2$	1327.00	1249.98	1249.98	60	23.7	0.00	54	26.4	53	273.4
$B-n57-k7_2$	–	–	2016.46	73	839.4	–	55	2967.7	–	–
$B-n57-k9_2$	3105.00	3074.10	3073.45	31	5.2	-2.10	27	4.6	30	47.3
$B-n63-k10_2$	2799.50	2753.80	2751.36	46	16.0	-5.34	51	16.8	53	1735.1
$B-n64-k9_2$	–	–	1158.52	66	354.4	–	58	645.9	–	–
$B-n66-k9_2$	–	–	2184.25	58	131.5	–	53	317.8	–	–
$B-n67-k10_2$	–	1309.27	1309.26	71	10.5	0.00	68	16.4	77	85.6
$B-n68-k9_2$	2365.00	–	2301.60	69	95.3	–	61	77.8	–	–
$B-n78-k10_2$	–	–	1937.17	67	89.5	–	66	102.0	–	–

Table EC. 8: Detailed results for the instances of class B with $\theta = 0.15$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_3$	1265.50	1256.23	1254.03	30	3.2	-23.73	28	4.1	28	12.0
$B-n34-k5_3$	1302.50	1289.02	1282.89	30	14.8	-45.47	34	14.6	29	43.9
$B-n35-k5_3$	1921.00	1785.36	1785.36	35	3.3	0.00	33	5.7	31	9.5
$B-n38-k6_3$	1387.50	1336.58	1336.58	32	2.4	0.00	33	3.2	30	3.6
$B-n39-k5_3$	1022.50	986.04	986.04	38	13.4	0.00	34	13.5	38	223.8
$B-n41-k6_3$	1294.00	1271.26	1271.26	42	12.5	0.00	34	26.9	51	292.1
$B-n43-k6_3$	1133.00	1116.72	1115.44	39	6.6	-7.86	39	11.2	34	59.5
$B-n44-k7_3$	1546.50	1486.19	1486.19	37	5.0	0.00	35	7.8	42	29.0
$B-n45-k5_3$	939.00	–	850.10	103	866.2	–	–	–	–	–
$B-n45-k6_3$	1011.50	–	988.25	55	104.3	–	53	945.1	–	–
$B-n50-k7_3$	1153.50	1071.80	1071.77	38	5.1	-0.04	33	6.3	34	7.1
$B-n50-k8_3$	2024.00	1993.69	1993.33	31	15.6	-1.19	27	12.1	29	312.2
$B-n51-k7_3$	–	1576.96	1574.95	59	132.4	–	55	303.3	68	3382.6
$B-n52-k7_3$	1452.00	1389.58	1387.42	61	96.8	-3.46	75	107.9	74	1836.5
$B-n56-k7_3$	1330.00	1254.68	1254.05	65	35.2	-0.84	64	47.0	64	500.3
$B-n57-k7_3$	–	–	2113.10	73	1370.1	–	–	–	–	–
$B-n57-k9_3$	3216.00	3174.89	3174.89	31	5.3	0.00	30	5.6	34	67.0
$B-n63-k10_3$	2869.50	2823.63	2822.77	48	17.4	-1.87	51	26.9	56	1340.1
$B-n64-k9_3$	–	–	1178.92	60	462.2	–	55	964.3	–	–
$B-n66-k9_3$	2300.50	–	2278.16	60	270.6	–	61	1816.8	–	–
$B-n67-k10_3$	–	1392.52	1392.52	65	10.3	0.00	64	17.0	56	179.7
$B-n68-k9_3$	–	–	2342.75	48	80.6	–	53	53.3	–	–
$B-n78-k10_3$	2406.50	–	1972.65	56	97.2	–	59	97.5	–	–

Table EC. 9: Detailed results for the instances of class B with $\theta = 0.20$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_4$	1308.50	1300.00	1299.57	34	3.1	-5.06	26	3.9	32	12.9
$B-n34-k5_4$	1306.00	1306.00	1302.07	29	12.9	–	27	11.0	28	50.7
$B-n35-k5_4$	1884.00	1752.39	1750.49	39	3.3	-1.44	34	3.7	29	10.8
$B-n38-k6_4$	1389.50	1338.28	1338.28	28	1.9	0.00	28	2.8	27	2.9
$B-n39-k5_4$	1038.50	994.18	994.18	45	13.6	0.00	38	13.4	44	327.2
$B-n41-k6_4$	1316.00	1297.84	1297.84	46	23.5	0.00	40	55.8	48	408.6
$B-n43-k6_4$	1138.50	1110.06	1109.58	37	8.9	-1.69	38	11.6	27	59.6
$B-n44-k7_4$	1641.50	1565.42	1565.42	35	4.6	0.00	34	6.0	39	17.0
$B-n45-k5_4$	987.50	–	905.04	98	1043.3	–	–	–	–	–
$B-n45-k6_4$	1060.50	–	1055.17	57	88.9	–	52	698.8	–	–
$B-n50-k7_4$	1191.00	1115.85	1115.85	33	5.8	0.00	38	9.6	38	12.8
$B-n50-k8_4$	2040.50	2020.53	2020.39	39	10.9	-0.70	33	11.0	36	141.6
$B-n51-k7_4$	1753.00	1664.20	1661.82	64	243.7	-2.68	61	301.7	64	3217.6
$B-n52-k7_4$	1499.50	1439.83	1438.48	62	74.1	-2.26	53	88.5	52	2251.0
$B-n56-k7_4$	1387.50	1304.87	1304.87	54	27.2	0.00	56	31.4	59	305.8
$B-n57-k7_4$	2237.00	–	2205.61	78	1410.1	–	–	–	–	–
$B-n57-k9_4$	3193.00	3171.60	3171.60	27	3.7	0.00	27	4.6	31	40.9
$B-n63-k10_4$	2895.00	2853.12	2851.98	44	16.7	-2.72	59	36.1	53	1939.5
$B-n64-k9_4$	–	–	1240.78	62	489.8	–	52	1299.9	–	–
$B-n66-k9_4$	2336.00	–	2299.82	58	189.4	–	58	1923.0	–	–
$B-n67-k10_4$	1516.50	1435.51	1435.44	47	10.1	-0.09	52	18.0	48	57.7
$B-n68-k9_4$	2423.00	–	2369.57	53	75.3	–	52	85.9	–	–
$B-n78-k10_4$	–	–	2064.86	54	91.3	–	65	165.4	–	–

Table EC. 10: Detailed results for the instances of class B with $\theta = 0.25$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_5$	1337.00	1330.00	1327.00	30	3.2	-42.86	31	5.1	26	12.0
$B-n34-k5_5$	1380.50	1377.07	1376.27	29	11.0	-23.32	32	21.8	27	43.0
$B-n35-k5_5$	1926.00	1780.50	1780.50	38	3.1	0.00	37	4.9	32	31.1
$B-n38-k6_5$	1446.00	1386.00	1386.00	20	1.5	0.00	24	2.3	20	1.8
$B-n39-k5_5$	1021.00	985.43	985.34	34	10.3	-0.24	36	14.5	32	228.7
$B-n41-k6_5$	1391.50	1373.83	1362.19	42	12.3	-65.87	39	58.5	47	561.7
$B-n43-k6_5$	1151.00	1121.71	1121.36	36	6.7	-1.19	38	14.9	37	81.5
$B-n44-k7_5$	1696.00	1617.35	1617.35	30	4.5	0.00	26	5.5	28	10.2
$B-n45-k5_5$	1014.00	–	926.82	88	893.1	–	–	–	–	–
$B-n45-k6_5$	1114.50	–	1101.52	61	115.4	–	52	1401.7	–	–
$B-n50-k7_5$	1246.50	1174.91	1174.86	42	9.5	-0.07	46	11.0	47	52.1
$B-n50-k8_5$	2108.00	2096.56	2096.31	32	9.2	-2.19	28	13.4	32	81.4
$B-n51-k7_5$	1835.50	1738.41	1733.36	53	340.4	-5.20	57	517.7	56	2398.2
$B-n52-k7_5$	1531.50	1465.08	1463.59	58	129.7	-2.24	58	139.2	50	2558.0
$B-n56-k7_5$	1409.00	1325.26	1322.99	67	25.2	-2.71	66	47.7	70	265.0
$B-n57-k9_5$	3282.50	3247.79	3247.77	38	6.4	-0.06	29	6.8	27	42.1
$B-n63-k10_5$	2970.00	2919.00	2915.58	51	23.7	-6.71	45	29.0	50	2243.6
$B-n64-k9_5$	–	–	1273.55	68	561.5	–	55	1286.6	–	–
$B-n66-k9_5$	2389.50	–	2353.05	72	261.5	–	61	3414.4	–	–
$B-n67-k10_5$	–	1492.36	1492.36	67	11.1	0.00	60	16.2	81	58.1
$B-n68-k9_5$	2492.00	2443.59	2443.59	59	107.8	0.00	52	111.7	52	3081.4
$B-n78-k10_5$	–	–	2121.30	96	150.3	–	86	371.0	–	–

Table EC. 11: Detailed results for the instances of class E-F-M with $\theta = 0.05$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_1$	568.00	–	563.22	73	1107.4	–	–	–	–	–
$E-n76-k7_1$	–	–	720.84	85	246.0	–	89	377.8	–	–
$E-n76-k8_1$	779.00	–	769.69	94	1193.2	–	87	2922.2	–	–
$E-n76-k10_1$	–	–	930.89	69	271.0	–	68	2179.8	–	–
$E-n76-k14_1$	1162.00	1147.24	1147.23	46	14.3	-0.07	45	175.6	55	607.3
$E-n101-k14_1$	–	1236.08	1235.90	57	31.9	–	57	61.7	56	2981.8
$F-n45-k4_1$	–	–	804.21	89	2181.5	–	78	3295.8	–	–
$M-n101-k10_1$	942.00	–	942.00	210	575.3	–	181	1151.9	–	–

Table EC. 12: Detailed results for the instances of class E-F-M with $\theta = 0.10$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_2$	614.00	–	606.11	74	1033.5	–	–	–	–	–
$E-n76-k7_2$	723.00	–	715.68	103	721.3	–	95	808.0	–	–
$E-n76-k8_2$	–	–	770.48	85	495.3	–	81	2536.8	–	–
$E-n76-k10_2$	–	–	927.74	76	354.2	–	66	2534.3	–	–
$E-n76-k14_2$	1170.50	1152.54	1152.53	38	15.1	-0.06	36	249.1	40	650.2
$E-n101-k14_2$	1277.50	1259.77	1259.77	69	36.1	0.00	66	57.6	65	3164.8
$F-n45-k4_2$	–	–	796.08	80	2455.0	–	85	2593.4	–	–
$M-n101-k10_2$	953.50	–	953.50	188	1637.0	–	176	670.0	–	–

Table EC. 13: Detailed results for the instances of class E-F-M with $\theta = 0.15$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_3$	632.00	–	624.56	75	1442.7	–	–	–	–	–
$E-n76-k7_3$	–	–	722.50	105	317.4	–	108	443.7	–	–
$E-n76-k8_3$	–	–	792.91	66	437.8	–	68	891.6	–	–
$E-n76-k10_3$	–	–	977.31	63	248.0	–	61	3337.9	–	–
$E-n76-k14_3$	1182.50	1172.97	1172.97	44	18.3	0.00	42	235.9	45	688.9
$E-n101-k14_3$	–	–	1283.98	57	68.0	–	59	113.0	–	–
$F-n45-k4_3$	845.00	–	835.00	99	1806.7	–	–	–	–	–
$M-n101-k10_3$	1017.00	–	1013.17	160	1161.1	–	147	1259.3	–	–

Table EC. 14: Detailed results for the instances of class E-F-M with $\theta = 0.20$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_4$	–	–	620.67	66	1661.0	–	–	–	–	–
$E-n76-k7_4$	–	–	754.37	87	987.9	–	88	1450.5	–	–
$E-n76-k8_4$	–	–	809.49	76	431.9	–	74	546.3	–	–
$E-n76-k10_4$	–	–	1006.50	69	334.7	–	62	3339.5	–	–
$E-n76-k14_4$	1196.50	1191.06	1191.06	36	15.5	0.00	38	164.4	41	476.5
$E-n101-k14_4$	–	–	1294.74	59	54.0	–	59	95.3	–	–
$F-n45-k4_4$	–	–	800.67	94	3028.5	–	82	2818.2	–	–
$M-n101-k10_4$	1031.50	–	1031.50	184	1110.2	–	163	341.5	–	–

Table EC. 15: Detailed results for the instances of class E-F-M with $\theta = 0.25$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_5$	–	–	649.17	74	1517.4	–	–	–	–	–
$E-n76-k7_5$	–	–	747.18	99	872.2	–	91	1055.2	–	–
$E-n76-k8_5$	–	–	820.13	64	283.5	–	66	533.9	–	–
$E-n76-k10_5$	–	–	1025.45	65	299.0	–	–	–	–	–
$E-n76-k14_5$	1255.00	1234.95	1234.95	41	19.3	0.00	40	172.8	46	590.5
$E-n101-k14_5$	–	–	1307.97	53	60.5	–	58	127.4	–	–
$M-n101-k10_5$	1056.50	–	1056.50	150	1381.3	–	157	1166.7	–	–

Table EC. 16: Detailed results for the instances of class P with $\theta = 0.05$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_1$	589.00	588.17	588.17	5	0.4	0.00	4	0.5	5	0.5
$P-n19-k2_1$	321.50	312.75	312.75	33	6.7	0.00	20	47.6	28	122.6
$P-n20-k2_1$	278.50	278.50	278.17	30	12.5	–	28	28.8	22	89.6
$P-n21-k2_1$	290.00	290.00	290.00	45	12.1	–	40	38.2	24	36.6
$P-n22-k2_1$	301.50	301.50	301.50	39	18.7	–	39	64.8	26	1326.4
$P-n22-k8_1$	763.00	730.00	730.00	10	0.5	0.00	7	0.5	9	0.5
$P-n23-k8_1$	680.00	680.00	680.00	10	0.5	–	9	0.6	10	0.6
$P-n40-k5_1$	550.50	550.50	550.50	45	9.1	–	48	12.3	37	66.0
$P-n45-k5_1$	585.00	–	579.06	41	38.8	–	47	71.9	–	–
$P-n50-k7_1$	638.50	633.19	633.19	31	5.4	-0.02	26	6.8	32	9.9
$P-n50-k8_1$	777.50	744.88	744.86	40	12.1	-0.04	40	91.4	43	500.9
$P-n50-k10_1$	868.00	854.17	854.17	24	1.4	0.00	29	3.0	31	6.8
$P-n51-k10_1$	839.00	828.06	828.06	25	2.1	0.00	22	5.6	26	5.2
$P-n55-k7_1$	688.00	682.97	682.97	44	15.2	0.00	42	28.5	45	1130.2
$P-n55-k8_1$	758.00	727.67	727.20	37	13.9	-1.55	36	130.7	44	1756.8
$P-n55-k10_1$	792.00	790.32	790.32	25	2.0	0.00	24	2.6	23	2.3
$P-n55-k15_1$	1155.00	1128.46	1128.35	28	1.8	-0.41	22	3.0	24	30.5
$P-n60-k10_1$	873.50	864.89	864.89	35	6.4	0.00	36	15.2	42	249.4
$P-n60-k15_1$	1129.50	1122.18	1122.18	17	0.9	0.00	18	1.3	15	1.1
$P-n65-k10_1$	970.00	956.35	956.35	37	12.4	0.00	40	25.4	42	2383.1
$P-n70-k10_1$	944.50	–	924.36	55	77.6	–	45	631.7	–	–

Table EC. 17: Detailed results for the instances of class P with $\theta = 0.10$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_2$	595.00	594.50	594.50	5	0.4	0.00	4	0.5	5	0.6
$P-n19-k2_2$	325.00	316.47	316.00	31	10.7	-5.50	24	37.3	30	201.1
$P-n20-k2_2$	300.00	299.00	293.00	38	22.8	-600.00	26	47.3	21	115.7
$P-n21-k2_2$	292.50	292.50	292.50	42	9.3	–	30	33.6	21	69.7
$P-n22-k2_2$	286.00	286.00	286.00	53	25.5	–	39	67.7	27	1322.2
$P-n22-k8_2$	758.00	727.75	727.75	10	0.4	0.00	7	0.5	11	0.6
$P-n23-k8_2$	706.00	706.00	706.00	10	0.4	–	7	0.5	8	0.7
$P-n40-k5_2$	598.00	592.80	592.80	32	7.2	0.00	32	12.4	33	141.3
$P-n45-k5_2$	572.00	–	566.97	48	55.9	–	49	151.2	–	–
$P-n50-k7_2$	656.50	649.43	649.43	28	3.9	0.00	29	7.3	31	14.1
$P-n50-k8_2$	–	748.29	748.26	40	18.8	0.00	35	108.3	39	1165.7
$P-n50-k10_2$	852.00	841.40	841.40	23	1.4	0.00	23	2.2	21	4.8
$P-n51-k10_2$	850.00	834.98	834.98	27	2.6	0.00	28	5.6	30	6.6
$P-n55-k7_2$	699.00	686.55	686.55	46	12.2	0.00	44	18.2	48	292.7
$P-n55-k8_2$	–	740.18	740.18	39	15.6	0.00	35	138.7	45	751.5
$P-n55-k10_2$	807.00	800.48	800.48	18	1.2	0.00	17	1.6	18	1.5
$P-n55-k15_2$	1177.50	1148.88	1148.88	30	1.9	0.00	22	2.6	28	33.5
$P-n60-k10_2$	902.00	887.83	887.83	33	6.4	0.00	34	14.2	34	175.0
$P-n60-k15_2$	1136.00	1123.59	1123.59	20	1.0	0.00	23	1.9	21	1.5
$P-n65-k10_2$	977.50	967.87	967.87	36	4.8	0.00	39	8.0	34	8.8
$P-n70-k10_2$	964.00	–	948.54	54	67.5	–	52	463.0	–	–

Table EC. 18: Detailed results for the instances of class P with $\theta = 0.15$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_3$	602.00	600.00	600.00	4	0.4	0.00	4	0.5	4	0.6
$P-n19-k2_3$	327.50	320.50	319.14	28	10.5	-19.39	26	97.6	25	200.0
$P-n20-k2_3$	303.00	303.00	301.33	28	10.0	–	26	77.2	28	123.5
$P-n21-k2_3$	275.50	275.50	275.50	41	11.1	0.00	29	24.3	25	34.8
$P-n22-k2_3$	302.00	302.00	302.00	51	33.5	0.00	46	193.0	32	617.2
$P-n22-k8_3$	772.00	740.80	740.80	8	0.4	0.00	6	0.6	9	0.6
$P-n23-k8_3$	708.50	708.50	708.50	10	0.5	0.00	6	0.6	8	0.6
$P-n40-k5_3$	597.50	592.13	592.13	39	11.8	0.00	34	15.5	37	112.2
$P-n45-k5_3$	593.00	–	584.48	47	62.6	–	48	115.5	–	–
$P-n50-k7_3$	662.00	652.18	652.18	29	6.6	0.00	31	10.7	32	74.1
$P-n50-k8_3$	–	765.59	765.38	37	14.3	–	41	203.6	39	1822.3
$P-n50-k10_3$	904.50	887.84	887.84	29	1.6	0.00	26	3.3	28	3.7
$P-n51-k10_3$	855.00	839.04	838.98	29	2.8	-0.41	25	5.3	34	6.8
$P-n55-k7_3$	706.00	699.06	699.06	47	19.3	0.00	47	28.6	46	820.8
$P-n55-k8_3$	–	780.59	780.59	37	16.0	0.00	36	161.0	39	876.8
$P-n55-k10_3$	837.50	831.11	831.11	23	1.4	0.00	24	2.4	23	1.9
$P-n55-k15_3$	1198.00	1178.35	1178.09	23	1.6	-1.32	21	3.2	24	42.6
$P-n60-k10_3$	868.00	863.42	863.42	32	5.9	0.00	33	13.8	39	126.8
$P-n60-k15_3$	1165.00	1157.39	1157.39	21	1.0	0.00	23	2.1	23	1.9
$P-n65-k10_3$	987.50	976.70	976.70	45	12.2	0.00	42	34.0	42	1421.0
$P-n70-k10_3$	–	–	955.17	54	81.1	–	46	976.5	–	–

Table EC. 19: Detailed results for the instances of class P with $\theta = 0.20$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_4$	607.00	604.33	604.33	5	0.4	0.00	4	0.5	5	0.6
$P-n19-k2_4$	332.00	328.23	328.23	28	8.6	0.00	23	60.2	27	136.2
$P-n20-k2_4$	305.00	305.00	305.00	40	21.3	0.00	31	72.4	22	213.3
$P-n21-k2_4$	307.50	307.50	307.50	38	19.2	0.00	35	141.9	27	411.6
$P-n22-k2_4$	329.00	329.00	329.00	44	23.8	0.00	40	91.3	29	303.2
$P-n22-k8_4$	781.50	747.50	747.50	9	0.4	0.00	7	0.5	9	0.5
$P-n23-k8_4$	698.00	698.00	698.00	11	0.4	0.00	10	0.6	13	0.6
$P-n40-k5_4$	613.50	606.82	606.82	50	13.4	0.00	36	19.0	36	368.9
$P-n45-k5_4$	589.00	–	585.25	49	67.2	–	45	183.1	–	–
$P-n50-k7_4$	656.00	648.50	648.50	34	6.6	0.00	36	11.6	33	75.0
$P-n50-k8_4$	–	806.27	806.27	35	15.7	0.00	34	156.4	37	1194.5
$P-n50-k10_4$	902.00	885.13	885.13	22	1.4	0.00	20	2.3	22	4.8
$P-n51-k10_4$	893.00	874.17	874.08	26	4.3	-0.48	23	5.3	28	8.1
$P-n55-k7_4$	721.00	712.54	712.25	28	12.2	-3.45	26	17.3	29	90.9
$P-n55-k8_4$	–	763.02	762.52	41	16.0	–	34	165.2	34	762.8
$P-n55-k10_4$	832.50	825.40	825.40	26	1.5	0.00	27	2.3	26	1.9
$P-n55-k15_4$	1192.00	1158.07	1158.07	24	2.2	0.00	17	3.2	22	38.4
$P-n60-k10_4$	876.50	876.50	876.50	26	3.3	0.00	30	8.2	29	30.1
$P-n60-k15_4$	1172.50	1161.69	1161.69	20	1.1	0.00	20	1.8	23	1.7
$P-n65-k10_4$	1043.00	1026.85	1026.85	40	14.8	0.00	36	24.0	37	804.6
$P-n70-k10_4$	1008.00	–	980.41	54	102.3	–	52	1405.0	–	–

Table EC. 20: Detailed results for the instances of class P with $\theta = 0.25$ by CG_b, CG_n and CG_h

Instance	z_{ip}	z_{lp_0}	z_{lp}	CG_b			CG_n		CG_h	
				#Iter	$t_{lp}(s)$	$\Delta_{lp}(\%)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_5$	616.50	614.33	614.33	6	0.6	0.00	4	0.5	6	0.5
$P-n19-k2_5$	357.50	350.00	350.00	31	16.0	0.00	27	89.6	25	117.6
$P-n20-k2_5$	314.00	300.25	300.25	33	27.8	0.00	32	111.3	25	365.0
$P-n21-k2_5$	319.50	319.50	319.50	43	15.1	0.00	35	84.2	26	37.6
$P-n22-k2_5$	312.50	312.50	312.50	45	18.8	0.00	51	155.0	30	107.4
$P-n22-k8_5$	790.00	763.17	763.17	9	0.4	0.00	6	0.6	9	0.5
$P-n23-k8_5$	719.00	719.00	719.00	9	0.4	0.00	6	0.5	8	0.6
$P-n40-k5_5$	614.50	605.68	605.64	36	10.3	-0.49	47	21.7	38	320.7
$P-n45-k5_5$	–	–	610.34	58	95.3	–	46	307.1	–	–
$P-n50-k7_5$	678.50	669.51	669.51	30	6.4	0.00	30	13.3	32	125.9
$P-n50-k8_5$	–	810.52	810.36	37	14.2	0.00	32	151.3	39	842.7
$P-n50-k10_5$	922.50	900.80	900.80	25	1.8	0.00	26	4.5	29	7.1
$P-n51-k10_5$	922.00	902.74	902.74	28	2.9	0.00	29	11.3	30	8.5
$P-n55-k7_5$	759.00	–	741.83	57	34.5	–	47	35.8	–	–
$P-n55-k8_5$	–	782.54	782.46	39	15.3	–	38	188.2	43	1306.1
$P-n55-k10_5$	848.50	844.69	844.69	27	2.3	0.00	29	3.8	26	3.4
$P-n55-k15_5$	1218.50	1188.37	1188.37	23	1.8	0.00	19	3.1	26	23.6
$P-n60-k10_5$	934.50	915.96	915.96	34	7.9	0.00	37	15.7	31	348.6
$P-n60-k15_5$	1159.00	1150.60	1150.60	14	0.9	0.00	18	1.3	18	1.2
$P-n65-k10_5$	1040.50	–	1028.19	44	12.8	–	42	28.0	–	–
$P-n70-k10_5$	1030.50	–	1006.52	50	115.7	–	47	1285.1	–	–

EC.2. Detailed results for the instances of class A by CG_b, CG_m, CG_t and CG_d

In this section, the corresponding detailed results are presented in Tables EC.21-EC.40. The columns have the same meaning as in Table 4.

Table EC. 21: Detailed results for the instances of class A with $\theta = 0.05$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_1$	1127.17	24	1.1	24	3.1	24	1.9	20	1.4
$A-n33-k5_1$	813.75	26	1.6	35	26.1	35	15.5	49	10.6
$A-n33-k6_1$	896.21	18	0.9	26	8.5	26	5.2	28	4.2
$A-n34-k5_1$	893.76	28	2.4	36	22.4	36	15.2	60	14.0
$A-n36-k5_1$	1051.30	27	1.8	39	38.6	39	26.3	39	11.1
$A-n37-k5_1$	813.38	28	2.5	45	48.9	45	32.8	42	18.6
$A-n37-k6_1$	1226.00	31	2.7	60	53.4	60	34.6	58	22.1
$A-n38-k5_1$	851.53	49	17.7	89	420.5	89	339.7	118	110.1
$A-n39-k5_1$	1004.50	39	11.3	65	360.4	65	264.8	78	77.2
$A-n39-k6_1$	1071.50	24	1.8	22	9.3	22	5.9	34	4.0
$A-n44-k6_1$	1140.90	36	8.8	94	385.1	94	275.7	124	129.0
$A-n45-k6_1$	1103.77	61	67.6	107	1074.4	107	785.7	160	344.5
$A-n45-k7_1$	1617.88	25	2.1	40	27.6	40	16.1	53	12.1
$A-n46-k7_1$	1201.06	26	1.4	31	6.2	31	3.4	36	3.8
$A-n48-k7_1$	1384.30	26	3.0	40	31.2	40	18.3	43	12.4
$A-n53-k7_1$	1302.22	48	36.2	82	638.8	82	435.5	130	234.8
$A-n54-k7_1$	1511.56	44	14.1	74	451.2	74	294.1	80	136.6
$A-n55-k9_1$	1317.96	36	2.6	46	75.1	46	47.0	49	14.0
$A-n60-k9_1$	1698.61	45	5.7	52	87.5	52	51.8	56	55.0
$A-n61-k9_1$	1151.30	61	63.5	121	1736.9	121	1217.7	158	795.5
$A-n62-k8_1$	1664.17	55	28.7	79	663.6	79	444.6	140	581.1
$A-n63-k9_1$	2203.38	60	48.2	104	1398.7	104	971.5	129	245.8
$A-n63-k10_1$	1714.65	43	7.2	46	61.6	46	38.9	66	40.9
$A-n64-k9_1$	1818.20	48	11.8	47	339.9	47	226.1	–	–
$A-n65-k9_1$	1335.38	52	58.5	90	966.0	90	653.2	79	286.2
$A-n69-k9_1$	1369.55	71	41.2	163	3455.9	163	2525.5	301	985.5
$A-n80-k10_1$	2314.03	58	82.4	–	–	112	2325.6	173	1201.1

Table EC. 22: Detailed results for the instances of class A with $\theta = 0.10$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_2$	1111.00	19	0.9	19	2.8	19	1.7	18	1.4
$A-n33-k5_2$	825.83	18	1.1	23	7.6	23	4.4	34	5.9
$A-n33-k6_2$	950.55	19	0.9	21	7.0	21	4.5	33	5.2
$A-n34-k5_2$	862.41	23	1.7	33	18.4	33	11.6	34	7.8
$A-n36-k5_2$	1098.07	34	3.2	37	65.4	37	45.2	43	18.8
$A-n37-k5_2$	831.25	28	2.5	41	59.3	41	38.7	47	8.8
$A-n37-k6_2$	1215.46	37	3.8	61	75.4	61	50.2	132	42.7
$A-n38-k5_2$	851.34	49	19.8	80	369.2	80	266.9	150	342.7
$A-n39-k5_2$	1020.71	62	33.7	95	422.9	95	307.3	85	122.3
$A-n39-k6_2$	1117.25	29	2.2	21	8.3	21	6.4	41	9.2
$A-n44-k6_2$	1170.29	29	7.1	50	211.3	50	144.4	58	97.8
$A-n45-k6_2$	1098.33	62	40.5	–	–	106	3207.8	165	743.7
$A-n45-k7_2$	1626.08	28	2.4	67	82.5	67	52.8	73	20.2
$A-n46-k7_2$	1197.50	27	1.3	23	4.1	23	2.3	36	3.6
$A-n48-k7_2$	1465.00	29	3.8	51	84.5	51	51.7	101	73.2
$A-n53-k7_2$	1330.17	45	19.2	95	545.3	95	360.9	195	793.7
$A-n54-k7_2$	1568.46	46	27.1	58	431.6	58	281.9	95	270.5
$A-n55-k9_2$	1364.23	35	3.1	48	68.7	48	43.9	60	20.4
$A-n60-k9_2$	1731.66	33	4.9	46	70.1	46	42.5	57	55.8
$A-n61-k9_2$	1174.13	59	50.6	107	1580.8	107	1100.2	228	788.5
$A-n62-k8_2$	1757.05	57	36.8	87	557.3	87	372.5	107	291.5
$A-n63-k9_2$	2285.87	46	32.9	102	796.9	102	574.2	121	332.8
$A-n63-k10_2$	1735.13	38	6.3	40	59.1	40	37.8	60	35.4
$A-n64-k9_2$	1904.07	46	13.9	65	673.3	65	422.4	108	207.0
$A-n65-k9_2$	1402.72	78	92.1	220	2150.4	220	1383.2	296	926.4
$A-n69-k9_2$	1377.69	66	35.1	141	1874.2	141	1343.9	231	469.5
$A-n80-k10_2$	2401.32	57	66.3	106	2023.2	106	1458.7	148	1115.5

Table EC. 23: Detailed results for the instances of class A with $\theta = 0.15$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_3$	1136.63	27	1.2	22	3.8	22	2.3	34	2.7
$A-n33-k5_3$	807.42	21	1.4	36	24.6	36	14.9	40	6.1
$A-n33-k6_3$	930.00	26	1.2	26	9.8	26	6.1	36	5.7
$A-n34-k5_3$	936.21	26	2.5	44	42.3	44	28.4	78	24.3
$A-n36-k5_3$	1094.75	31	2.3	35	30.3	35	19.7	69	29.8
$A-n37-k5_3$	847.87	38	5.4	36	62.2	36	42.8	51	15.3
$A-n37-k6_3$	1300.17	33	3.3	74	83.4	74	55.6	81	52.6
$A-n38-k5_3$	848.11	62	29.7	90	569.4	90	419.4	151	488.6
$A-n39-k5_3$	1072.52	41	18.3	56	516.3	56	384.1	79	96.5
$A-n39-k6_3$	1158.00	25	2.3	20	8.6	20	5.9	27	5.6
$A-n44-k6_3$	1180.94	30	6.4	43	138.4	43	90.6	52	59.3
$A-n45-k6_3$	1134.75	58	61.4	110	3516.5	110	3384	270	1391.8
$A-n45-k7_3$	1614.17	27	3.4	40	53.3	40	32.1	50	36.9
$A-n46-k7_3$	1238.33	33	1.7	34	13.3	34	7.5	51	5.4
$A-n48-k7_3$	1468.75	34	4.2	30	21.7	30	12.7	73	36.8
$A-n53-k7_3$	1350.21	47	26.0	126	988.0	126	691.2	238	913.4
$A-n54-k7_3$	1575.56	46	41.6	71	421.8	71	287.2	349	1438.1
$A-n55-k9_3$	1418.25	32	2.8	43	74.0	43	47.6	82	26.7
$A-n60-k9_3$	1723.09	40	6.9	63	100.4	65	68.4	63	40.9
$A-n61-k9_3$	1216.06	51	58.1	89	1797.4	89	1242.7	181	1001.5
$A-n62-k8_3$	1730.78	54	38.7	73	813.2	73	552.9	106	450.2
$A-n63-k9_3$	2434.97	35	38.4	82	1318.3	82	870.0	92	342.2
$A-n63-k10_3$	1778.74	52	13.4	57	366.0	57	231.5	77	48.4
$A-n64-k9_3$	1973.66	47	16.2	60	572.1	60	372.7	105	310.8
$A-n65-k9_3$	1421.83	81	116.9	238	2699.5	238	1621.4	288	876.8
$A-n69-k9_3$	1380.82	77	57.3	–	–	–	–	243	2483.8
$A-n80-k10_3$	2488.87	47	151.9	98	3085.8	98	2230.4	144	1655.7

Table EC. 24: Detailed results for the instances of class A with $\theta = 0.20$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_4$	1185.83	20	1.0	21	2.9	21	1.8	33	2.9
$A-n33-k5_4$	876.08	21	1.5	30	21.4	30	13.1	44	7.6
$A-n33-k6_4$	955.60	19	1.0	18	6.1	18	4.0	38	7.2
$A-n34-k5_4$	903.19	22	2.8	28	15.7	28	10.1	40	13.1
$A-n36-k5_4$	1055.58	29	3.1	52	86.1	52	59.1	40	42.8
$A-n37-k5_4$	838.80	27	3.3	34	102.0	34	71.3	47	28.2
$A-n37-k6_4$	1293.11	34	3.6	71	80.7	71	53.6	58	29.3
$A-n38-k5_4$	962.49	53	26.0	112	589.6	112	449.5	146	217.5
$A-n39-k5_4$	1156.15	30	15.2	67	591.8	67	434.1	100	264.8
$A-n39-k6_4$	1156.50	32	2.0	30	23.2	30	16.4	45	22.0
$A-n44-k6_4$	1182.77	33	6.5	48	156.1	48	103.6	59	66.7
$A-n45-k6_4$	1160.67	66	80.8	109	1080.8	109	739.8	174	911.6
$A-n45-k7_4$	1732.37	29	3.1	56	79.0	56	47.2	72	31.9
$A-n46-k7_4$	1252.35	27	1.6	24	5.0	24	3.0	31	4.5
$A-n48-k7_4$	1496.42	31	4.4	38	36.2	38	22.1	58	23.7
$A-n53-k7_4$	1376.97	49	33.3	75	445.6	75	296.4	139	391.2
$A-n54-k7_4$	1610.55	40	33.2	60	655.1	60	440.6	90	283.9
$A-n55-k9_4$	1413.69	43	4.8	79	171.1	79	107.6	141	131.2
$A-n60-k9_4$	1758.60	42	6.2	55	114.8	55	70.0	72	84.6
$A-n61-k9_4$	1257.79	55	53.7	91	2290.6	91	1580.1	188	965.9
$A-n62-k8_4$	1842.07	48	66.2	65	1212.7	65	796.5	103	473.2
$A-n63-k9_4$	2370.99	49	60.3	–	–	146	2454.1	193	941.1
$A-n63-k10_4$	1811.28	35	5.4	52	109.7	52	67.3	83	38.2
$A-n64-k9_4$	2035.84	43	17.4	68	1642.9	68	1176.5	107	916.0
$A-n65-k9_4$	1472.94	79	206.0	207	1917.0	207	1362.3	205	488.9
$A-n69-k9_4$	1479.77	71	68.3	–	–	–	–	280	2973.6
$A-n80-k10_4$	2504.54	49	158.7	–	–	–	–	182	2386.8

Table EC. 25: Detailed results for the instances of class A with $\theta = 0.25$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$A-n32-k5_5$	1156.60	23	1.3	23	4.7	23	3.0	30	4.7
$A-n33-k5_5$	921.65	22	1.3	35	30.4	35	20.1	31	9.0
$A-n33-k6_5$	941.36	20	1.1	26	9.8	26	6.2	30	7.8
$A-n34-k5_5$	925.62	26	2.9	37	24.3	37	15.1	54	16.6
$A-n36-k5_5$	1138.25	25	2.8	33	57.5	33	41.3	45	14.0
$A-n37-k5_5$	832.00	31	3.5	40	103.5	40	76.9	41	10.7
$A-n37-k6_5$	1335.12	28	3.4	50	86.2	50	55.2	109	38.3
$A-n38-k5_5$	922.33	61	40.8	75	542.7	75	390.2	146	236.4
$A-n39-k5_5$	1107.12	36	18.1	60	622.3	60	461.1	71	178.9
$A-n39-k6_5$	1192.50	28	2.7	27	17.4	27	11.5	34	6.3
$A-n44-k6_5$	1195.63	33	8.4	75	395.4	75	274.1	99	155.1
$A-n45-k6_5$	1149.25	62	63.2	–	–	–	–	382	1801.8
$A-n45-k7_5$	1755.04	25	3.5	44	99.3	44	59.8	61	69.9
$A-n46-k7_5$	1307.67	28	1.6	31	8.2	29	4.9	41	6.5
$A-n48-k7_5$	1509.21	31	4.7	38	72.7	38	46.0	52	31.7
$A-n53-k7_5$	1402.72	46	41.3	84	968.0	84	676.7	145	541.2
$A-n54-k7_5$	1670.89	43	45.3	69	899.2	69	594.5	92	376.7
$A-n55-k9_5$	1432.66	44	4.0	49	57.8	49	35.9	52	28.8
$A-n60-k9_5$	1838.45	38	8.0	55	199.9	55	127.0	–	–
$A-n61-k9_5$	1274.86	51	63.0	110	2993.2	110	2055.3	202	1934.9
$A-n62-k8_5$	1832.64	52	55.9	77	1505.0	77	1026.1	114	1177.8
$A-n63-k9_5$	2533.70	50	60.9	88	1992.2	88	1551.8	140	1028.3
$A-n63-k10_5$	1849.63	33	6.0	32	97.1	32	61.1	95	96.5
$A-n64-k9_5$	2077.46	48	15.9	53	606.8	53	436.5	98	507.8
$A-n65-k9_5$	1519.32	73	163.1	242	3332.7	242	2302.4	217	635.0
$A-n69-k9_5$	1503.68	52	50.4	–	2455.8	110	1598.4	151	3153.5
$A-n80-k10_5$	2657.40	61	207.1	–	–	–	–	344	2504.4

Table EC. 26: Detailed results for the instances of class B with $\theta = 0.05$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_1$	1206.83	35	3.0	49	51.7	49	26.7	47	22.7
$B-n34-k5_1$	1232.71	28	6.9	37	80.2	37	54.3	46	35.0
$B-n35-k5_1$	1661.93	35	2.1	53	23.8	53	15.0	104	66.7
$B-n38-k6_1$	1241.92	33	2.3	40	87.5	40	59.2	41	9.7
$B-n39-k5_1$	950.67	41	10.9	47	345.0	47	243.0	66	204.3
$B-n41-k6_1$	1251.81	43	11.6	94	325.6	94	207.3	107	98.4
$B-n43-k6_1$	1038.29	44	7.4	60	106.1	60	68.6	81	45.7
$B-n44-k7_1$	1446.03	30	3.9	32	110.3	32	69.8	34	29.5
$B-n45-k5_1$	848.05	83	357.4	–	–	–	–	131	2337.8
$B-n45-k6_1$	938.34	58	98.6	118	1930.3	118	1417.9	134	832.1
$B-n50-k7_1$	1010.81	28	3.1	37	48.4	37	32.0	36	29.3
$B-n50-k8_1$	1915.34	38	9.9	70	209.8	70	132.5	92	65.6
$B-n51-k7_1$	1473.83	64	189.4	–	–	–	–	252	2583.6
$B-n52-k7_1$	1306.93	69	53.1	104	359.0	–	–	174	263.4
$B-n56-k7_1$	1203.60	56	20.6	83	1167.1	83	886.3	134	983.3
$B-n57-k7_1$	1999.01	98	1261.2	–	–	–	–	–	–
$B-n57-k9_1$	2998.59	40	4.1	40	43.2	40	30.2	62	33.9
$B-n63-k10_1$	2681.69	48	12.4	77	349.5	77	246.6	122	141.5
$B-n64-k9_1$	1116.70	72	505.9	–	–	–	–	–	–
$B-n66-k9_1$	2140.14	65	111.5	–	–	–	–	–	–
$B-n67-k10_1$	1353.84	52	8.1	74	601.5	74	338.0	75	60.5
$B-n68-k9_1$	2175.99	63	61.2	–	–	118	2996.7	115	1671.2
$B-n78-k10_1$	1920.21	85	80.8	–	–	150	2800.2	193	1060.8

Table EC. 27: Detailed results for the instances of class B with $\theta = 0.10$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_2$	1238.20	27	2.1	33	19.9	33	15.1	36	13.3
$B-n34-k5_2$	1250.57	34	9.1	44	99.7	44	79.9	58	57.2
$B-n35-k5_2$	1640.71	31	2.4	53	39.6	53	26.7	79	18.8
$B-n38-k6_2$	1257.28	34	1.9	42	23.0	42	15.4	50	34.7
$B-n39-k5_2$	985.64	35	18.6	51	1214.3	51	949.4	71	641.9
$B-n41-k6_2$	1258.52	40	11.4	101	450.7	101	322.6	181	219.8
$B-n43-k6_2$	1056.46	32	6.7	49	96.5	49	66.8	56	49.9
$B-n44-k7_2$	1500.35	27	3.4	43	116.9	43	76.8	52	38.5
$B-n45-k5_2$	843.00	86	649.8	–	–	–	–	–	–
$B-n45-k6_2$	994.22	58	110.0	134	1918.7	134	1357.1	128	859.5
$B-n50-k7_2$	1047.07	27	3.0	34	30.8	34	19.7	38	11.8
$B-n50-k8_2$	1945.60	33	11.2	41	226.0	38	139.3	51	61.7
$B-n51-k7_2$	1506.47	60	232.0	–	–	–	–	–	–
$B-n52-k7_2$	1310.88	65	125.3	83	529.1	83	378.7	–	–
$B-n56-k7_2$	1249.98	60	23.7	79	1006.4	79	827.3	145	1588.4
$B-n57-k7_2$	2016.46	73	839.4	–	–	–	–	–	–
$B-n57-k9_2$	3073.45	31	5.2	43	220.3	43	169.8	61	103.8
$B-n63-k10_2$	2751.36	46	16.0	86	648.1	86	519.1	147	2174.4
$B-n64-k9_2$	1158.52	66	354.4	–	–	–	–	–	–
$B-n66-k9_2$	2184.25	58	131.5	–	–	–	–	–	–
$B-n67-k10_2$	1309.26	71	10.5	117	525.2	117	429.4	106	186.7
$B-n68-k9_2$	2301.60	69	95.3	–	–	–	–	–	–
$B-n78-k10_2$	1937.17	67	89.5	–	–	–	–	171	1756.6

Table EC. 28: Detailed results for the instances of class B with $\theta = 0.15$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_3$	1254.03	30	3.2	36	46.9	36	42.6	38	16.7
$B-n34-k5_3$	1282.89	30	14.8	36	102.8	36	96.5	50	167.9
$B-n35-k5_3$	1785.36	35	3.3	44	34.7	44	30.4	60	12.2
$B-n38-k6_3$	1336.58	32	2.4	38	28.5	38	24.7	60	15.9
$B-n39-k5_3$	986.04	38	13.4	52	1471.8	52	1398.5	76	846.9
$B-n41-k6_3$	1271.26	42	12.5	89	389.6	89	327.7	100	172.0
$B-n43-k6_3$	1115.44	39	6.6	50	151.2	50	144.5	80	364.5
$B-n44-k7_3$	1486.19	37	5.0	44	192.0	44	159.3	70	124.6
$B-n45-k5_3$	850.10	103	866.2	–	–	–	–	–	–
$B-n45-k6_3$	988.25	55	104.3	–	–	–	–	151	2496.1
$B-n50-k7_3$	1071.77	38	5.1	53	271.8	53	209.0	98	126.7
$B-n50-k8_3$	1993.33	31	15.6	35	195.4	35	129.4	63	160.2
$B-n51-k7_3$	1574.95	59	132.4	–	–	–	–	–	–
$B-n52-k7_3$	1387.42	61	96.8	125	1055.5	125	718.4	111	384.2
$B-n56-k7_3$	1254.05	65	35.2	136	3454.3	136	2533.9	–	–
$B-n57-k7_3$	2113.10	73	1370.1	–	–	–	–	–	–
$B-n57-k9_3$	3174.89	31	5.3	39	140.0	39	88.1	63	90.4
$B-n63-k10_3$	2822.77	48	17.4	72	668.2	72	541.3	129	349.0
$B-n64-k9_3$	1178.92	60	462.2	–	–	–	–	–	–
$B-n66-k9_3$	2278.16	60	270.6	–	–	–	–	–	–
$B-n67-k10_3$	1392.52	65	10.3	103	599.2	103	409.1	193	674.3
$B-n68-k9_3$	2342.75	48	80.6	–	–	95	3102.7	99	1606.6
$B-n78-k10_3$	1972.65	56	97.2	–	–	–	–	–	–

Table EC. 29: Detailed results for the instances of class B with $\theta = 0.20$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_4$	1299.57	34	3.1	34	29.5	34	24.0	37	20.4
$B-n34-k5_4$	1302.07	29	12.9	46	138.6	46	120.0	59	56.4
$B-n35-k5_4$	1750.49	39	3.3	49	42.5	49	35.7	75	31.9
$B-n38-k6_4$	1338.28	28	1.9	41	29.1	41	23.7	64	14.3
$B-n39-k5_4$	994.18	45	13.6	71	880.8	71	799.0	78	576.1
$B-n41-k6_4$	1297.84	46	23.5	109	1004.1	109	854.7	137	710.1
$B-n43-k6_4$	1109.58	37	8.9	43	168.7	43	142.3	59	70.1
$B-n44-k7_4$	1565.42	35	4.6	64	422.4	64	344.7	108	309.5
$B-n45-k5_4$	905.04	98	1043.3	–	–	–	–	131	3346.4
$B-n45-k6_4$	1055.17	57	88.9	–	–	–	–	173	2391.3
$B-n50-k7_4$	1115.85	33	5.8	52	351.5	52	292.8	98	34.2
$B-n50-k8_4$	2020.39	39	10.9	46	103.0	46	72.8	46	40.9
$B-n51-k7_4$	1661.82	64	243.7	–	–	–	–	–	–
$B-n52-k7_4$	1438.48	62	74.1	89	898.0	89	716.8	130	526.9
$B-n56-k7_4$	1304.87	54	27.2	84	916.9	84	762.3	119	1075.2
$B-n57-k7_4$	2205.61	78	1410.1	–	–	–	–	–	–
$B-n57-k9_4$	3171.60	27	3.7	32	97.3	32	73.7	50	56.3
$B-n63-k10_4$	2851.98	44	16.7	89	908.4	89	715.7	97	608.0
$B-n64-k9_4$	1240.78	62	489.8	–	–	–	–	–	–
$B-n66-k9_4$	2299.82	58	189.4	–	–	–	–	–	–
$B-n67-k10_4$	1435.44	47	10.1	65	673.5	65	463.4	83	390.0
$B-n68-k9_4$	2369.57	53	75.3	–	–	–	–	190	2940.1
$B-n78-k10_4$	2064.86	54	91.3	–	–	–	–	133	3207.6

Table EC. 30: Detailed results for the instances of class B with $\theta = 0.25$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$B-n31-k5_5$	1327.00	30	3.2	37	55.3	37	51.5	39	20.0
$B-n34-k5_5$	1376.27	29	11.0	33	96.5	33	89.5	58	109.5
$B-n35-k5_5$	1780.50	38	3.1	47	42.5	47	36.1	126	40.0
$B-n38-k6_5$	1386.00	20	1.5	23	10.3	23	7.6	38	6.3
$B-n39-k5_5$	985.34	34	10.3	48	1028.2	48	880.8	69	1915.7
$B-n41-k6_5$	1362.19	42	12.3	111	639.3	111	557.6	132	219.6
$B-n43-k6_5$	1121.36	36	6.7	53	178.7	53	150.7	57	68.6
$B-n44-k7_5$	1617.35	30	4.5	40	254.9	40	189.8	54	204.2
$B-n45-k5_5$	926.82	88	893.1	–	–	–	–	–	–
$B-n45-k6_5$	1101.52	61	115.4	118	2865.3	118	2148.7	158	1248.6
$B-n50-k7_5$	1174.86	42	9.5	73	388.4	73	308.3	75	35.6
$B-n50-k8_5$	2096.31	32	9.2	37	109.3	37	74.8	44	40.8
$B-n51-k7_5$	1733.36	53	340.4	–	–	–	–	–	–
$B-n52-k7_5$	1463.59	58	129.7	81	1413.9	81	1225.8	104	819.6
$B-n56-k7_5$	1322.99	67	25.2	101	1218.7	101	960.7	–	–
$B-n57-k9_5$	3247.77	38	6.4	52	289.8	52	236.7	101	117.8
$B-n63-k10_5$	2915.58	51	23.7	76	925.8	76	757.7	94	290.7
$B-n64-k9_5$	1273.55	68	561.5	–	–	–	–	–	–
$B-n66-k9_5$	2353.05	72	261.5	–	–	–	–	–	–
$B-n67-k10_5$	1492.36	67	11.1	88	806.0	88	629.0	169	360.6
$B-n68-k9_5$	2443.59	59	107.8	–	–	–	–	–	–
$B-n78-k10_5$	2121.30	96	150.3	–	–	–	–	–	–

Table EC. 31: Detailed results for the instances of class E-F-M with $\theta = 0.05$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_1$	563.22	73	1107.4	–	–	–	–	–	–
$E-n76-k7_1$	720.84	85	246.0	–	–	–	–	–	–
$E-n76-k8_1$	769.69	94	1193.2	–	–	–	–	–	–
$E-n76-k10_1$	930.89	69	271.0	–	–	–	–	–	–
$E-n76-k14_1$	1147.23	46	14.3	71	342.5	71	221.8	85	83.4
$E-n101-k14_1$	1235.90	57	31.9	102	2495.4	102	1597.9	127	1046.5
$F-n45-k4_1$	804.21	89	2181.5	–	–	–	–	–	–
$M-n101-k10_1$	942.00	210	575.3	–	–	–	–	–	–

Table EC. 32: Detailed results for the instances of class E-F-M with $\theta = 0.10$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_2$	606.11	74	1033.5	–	–	–	–	–	–
$E-n76-k7_2$	715.68	103	721.3	–	–	–	–	–	–
$E-n76-k8_2$	770.48	85	495.3	–	–	–	–	–	–
$E-n76-k10_2$	927.74	76	354.2	–	–	–	–	–	–
$E-n76-k14_2$	1152.53	38	15.1	57	312.7	57	174.0	78	71.4
$E-n101-k14_2$	1259.77	69	36.1	120	3242.8	120	2189.7	261	833.7
$F-n45-k4_2$	796.08	80	2455.0	–	–	–	–	–	–
$M-n101-k10_2$	953.50	188	1637.0	–	–	–	–	–	–

Table EC. 33: Detailed results for the instances of class E-F-M with $\theta = 0.15$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_3$	624.56	75	1442.7	–	–	–	–	–	–
$E-n76-k7_3$	722.50	105	317.4	–	–	–	–	–	–
$E-n76-k8_3$	792.91	66	437.8	–	–	–	–	–	–
$E-n76-k10_3$	977.31	63	248.0	–	–	–	–	–	–
$E-n76-k14_3$	1172.97	44	18.3	69	398.7	69	225.6	123	184.2
$E-n101-k14_3$	1283.98	57	68.0	–	–	–	–	171	1518.2
$F-n45-k4_3$	835.00	99	1806.7	–	–	–	–	–	–
$M-n101-k10_3$	1013.17	160	1161.1	–	–	–	–	–	–

Table EC. 34: Detailed results for the instances of class E-F-M with $\theta = 0.20$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_4$	620.67	66	1661.0	–	–	–	–	–	–
$E-n76-k7_4$	754.37	87	987.9	–	–	–	–	–	–
$E-n76-k8_4$	809.49	76	431.9	–	–	–	–	–	–
$E-n76-k10_4$	1006.50	69	334.7	–	–	–	–	–	–
$E-n76-k14_4$	1191.06	36	15.5	49	254.5	49	132.8	94	148.3
$E-n101-k14_4$	1294.74	59	54.0	118	3579.8	118	2473.2	183	1216.6
$F-n45-k4_4$	800.67	94	3028.5	–	–	–	–	–	–
$M-n101-k10_4$	1031.50	184	1110.2	–	–	–	–	–	–

Table EC. 35: Detailed results for the instances of class E-F-M with $\theta = 0.25$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$E-n51-k5_5$	649.17	74	1517.4	–	–	–	–	–	–
$E-n76-k7_5$	747.18	99	872.2	–	–	–	–	–	–
$E-n76-k8_5$	820.13	64	283.5	–	–	–	–	–	–
$E-n76-k10_5$	1025.45	65	299.0	–	–	–	–	–	–
$E-n76-k14_5$	1234.95	41	19.3	62	447.9	62	293.6	101	142.4
$E-n101-k14_5$	1307.97	53	60.5	–	–	–	–	118	938.3
$M-n101-k10_5$	1056.50	150	1381.3	–	–	–	–	–	–

Table EC. 36: Detailed results for the instances of class P with $\theta = 0.05$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_1$	588.17	5	0.4	5	1.6	5	0.7	5	0.7
$P-n19-k2_1$	312.75	33	6.7	56	69.5	56	57.2	53	42.0
$P-n20-k2_1$	278.17	30	12.5	41	76.3	41	79.1	51	77.5
$P-n21-k2_1$	290.00	45	12.1	108	302.0	108	276.0	133	87.4
$P-n22-k2_1$	301.50	39	18.7	146	868.4	146	643.0	177	177.5
$P-n22-k8_1$	730.00	10	0.5	8	1.7	8	0.6	9	0.6
$P-n23-k8_1$	680.00	10	0.5	8	1.5	8	0.6	8	0.6
$P-n40-k5_1$	550.50	45	9.1	58	130.8	58	83.3	83	42.0
$P-n45-k5_1$	579.06	41	38.8	70	1283.0	70	919.0	119	687.6
$P-n50-k7_1$	633.19	31	5.4	42	81.0	42	48.6	37	33.1
$P-n50-k8_1$	744.86	40	12.1	70	285.2	70	183.8	65	108.7
$P-n50-k10_1$	854.17	24	1.4	40	14.9	40	9.1	45	5.3
$P-n51-k10_1$	828.06	25	2.1	28	16.2	28	9.3	54	7.3
$P-n55-k7_1$	682.97	44	15.2	79	1132.3	79	763.1	97	402.0
$P-n55-k8_1$	727.20	37	13.9	66	1273.1	66	949.7	82	188.5
$P-n55-k10_1$	790.32	25	2.0	24	14.8	24	9.2	28	4.6
$P-n55-k15_1$	1128.35	28	1.8	28	13.3	28	8.7	39	4.4
$P-n60-k10_1$	864.89	35	6.4	43	98.1	43	62.4	56	32.0
$P-n60-k15_1$	1122.18	17	0.9	17	3.5	17	1.7	17	1.2
$P-n65-k10_1$	956.35	37	12.4	67	306.0	67	186.3	117	79.6
$P-n70-k10_1$	924.36	55	77.6	110	2708.8	110	1861.4	131	799.0

Table EC. 37: Detailed results for the instances of class P with $\theta = 0.10$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_2$	594.50	5	0.4	4	1.7	4	0.6	4	0.5
$P-n19-k2_2$	316.00	31	10.7	64	147.7	64	107.1	70	72.2
$P-n20-k2_2$	293.00	38	22.8	41	129.4	41	89.5	52	156.6
$P-n21-k2_2$	292.50	42	9.3	66	91.6	66	62.5	86	50.2
$P-n22-k2_2$	286.00	53	25.5	101	419.2	101	300.4	117	197.9
$P-n22-k8_2$	727.75	10	0.4	8	1.7	8	0.6	10	0.8
$P-n23-k8_2$	706.00	10	0.4	7	1.5	7	0.7	10	0.7
$P-n40-k5_2$	592.80	32	7.2	43	101.1	43	66.4	61	29.7
$P-n45-k5_2$	566.97	48	55.9	126	3507.9	126	2431.1	240	557.6
$P-n50-k7_2$	649.43	28	3.9	37	62.5	37	37.3	49	28.2
$P-n50-k8_2$	748.26	40	18.8	61	518.4	61	339.0	75	117.4
$P-n50-k10_2$	841.40	23	1.4	24	11.6	24	7.3	28	2.7
$P-n51-k10_2$	834.98	27	2.6	34	22.3	34	13.7	47	13.2
$P-n55-k7_2$	686.55	46	12.2	70	497.2	70	329.0	78	145.3
$P-n55-k8_2$	740.18	39	15.6	87	762.9	87	551.9	99	207.0
$P-n55-k10_2$	800.48	18	1.2	18	5.8	18	2.9	25	2.5
$P-n55-k15_2$	1148.88	30	1.9	35	12.5	35	6.8	37	5.5
$P-n60-k10_2$	887.83	33	6.4	56	161.3	56	104.2	88	71.2
$P-n60-k15_2$	1123.59	20	1.0	20	4.4	20	2.6	33	2.3
$P-n65-k10_2$	967.87	36	4.8	49	65.9	49	39.7	68	19.3
$P-n70-k10_2$	948.54	54	67.5	106	2220.3	106	1488.4	154	613.9

Table EC. 38: Detailed results for the instances of class P with $\theta = 0.15$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_3$	600.00	4	0.4	5	1.6	5	0.6	4	0.6
$P-n19-k2_3$	319.14	28	10.5	64	360.3	64	288.3	42	121.5
$P-n20-k2_3$	301.33	28	10.0	63	470.4	63	339.1	90	115.1
$P-n21-k2_3$	275.50	41	11.1	40	61.5	40	41.3	57	22.7
$P-n22-k2_3$	302.00	51	33.5	163	1127.4	163	824.5	131	192.1
$P-n22-k8_3$	740.80	8	0.4	7	1.7	7	0.6	8	0.6
$P-n23-k8_3$	708.50	10	0.5	8	1.6	8	0.7	11	0.6
$P-n40-k5_3$	592.13	39	11.8	51	115.9	51	75.0	90	48.4
$P-n45-k5_3$	584.48	47	62.6	121	3071.8	121	2268.4	271	1128.8
$P-n50-k7_3$	652.18	29	6.6	39	217.4	39	143.8	58	43.4
$P-n50-k8_3$	765.38	37	14.3	64	453.0	64	288.3	81	134.2
$P-n50-k10_3$	887.84	29	1.6	29	13.8	29	8.3	50	6.3
$P-n51-k10_3$	838.98	29	2.8	35	23.3	35	13.5	52	9.3
$P-n55-k7_3$	699.06	47	19.3	94	1562.2	94	1052.5	139	264.7
$P-n55-k8_3$	780.59	37	16.0	81	1556.3	81	1136.9	104	189.6
$P-n55-k10_3$	831.11	23	1.4	25	12.4	25	6.8	38	5.1
$P-n55-k15_3$	1178.09	23	1.6	31	11.5	31	7.1	40	7.2
$P-n60-k10_3$	863.42	32	5.9	50	164.4	50	102.0	74	28.2
$P-n60-k15_3$	1157.39	21	1.0	21	5.0	21	2.7	33	2.6
$P-n65-k10_3$	976.70	45	12.2	97	655.9	97	431.1	183	392.9
$P-n70-k10_3$	955.17	54	81.1	–	–	136	2719.3	182	1618.8

Table EC. 39: Detailed results for the instances of class P with $\theta = 0.20$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_4$	604.33	5	0.4	6	1.7	6	0.6	5	0.6
$P-n19-k2_4$	328.23	28	8.6	53	116.2	53	81.1	68	79.0
$P-n20-k2_4$	305.00	40	21.3	83	461.3	83	327.2	69	90.4
$P-n21-k2_4$	307.50	38	19.2	101	1186.5	101	900.1	123	246.0
$P-n22-k2_4$	329.00	44	23.8	102	759.8	114	503.3	184	130.6
$P-n22-k8_4$	747.50	9	0.4	7	1.8	7	0.6	10	0.7
$P-n23-k8_4$	698.00	11	0.4	9	1.6	9	0.6	11	0.7
$P-n40-k5_4$	606.82	50	13.4	60	192.4	60	121.5	89	69.7
$P-n45-k5_4$	585.25	49	67.2	–	–	149	2810.7	241	1591.4
$P-n50-k7_4$	648.50	34	6.6	58	449.0	58	298.2	101	99.0
$P-n50-k8_4$	806.27	35	15.7	77	515.5	77	359.2	109	215.6
$P-n50-k10_4$	885.13	22	1.4	25	12.9	25	7.6	45	5.8
$P-n51-k10_4$	874.08	26	4.3	32	23.8	32	14.8	49	13.1
$P-n55-k7_4$	712.25	28	12.2	42	377.1	42	251.5	46	82.7
$P-n55-k8_4$	762.52	41	16.0	76	494.4	76	338.3	101	260.4
$P-n55-k10_4$	825.40	26	1.5	31	15.6	31	9.0	38	5.1
$P-n55-k15_4$	1158.07	24	2.2	27	17.6	27	10.2	46	9.3
$P-n60-k10_4$	876.50	26	3.3	36	68.3	36	40.8	45	35.4
$P-n60-k15_4$	1161.69	20	1.1	19	3.6	19	1.9	21	1.8
$P-n65-k10_4$	1026.85	40	14.8	67	409.1	67	252.5	156	267.5
$P-n70-k10_4$	980.41	54	102.3	–	–	138	3158.1	178	2473.7

Table EC. 40: Detailed results for the instances of class P with $\theta = 0.25$ by CG_b, CG_m, CG_t and CG_d

Instance	z_{lp}	CG_b		CG_m		CG_t		CG_d	
		#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$	#Iter	$t_{lp}(s)$
$P-n16-k8_5$	614.33	6	0.6	5	1.6	5	0.6	6	0.5
$P-n19-k2_5$	350.00	31	16.0	59	162.5	59	124.7	60	171.3
$P-n20-k2_5$	300.25	33	27.8	77	2068.6	77	1635.8	90	261.8
$P-n21-k2_5$	319.50	43	15.1	121	811.9	121	595.5	70	52.5
$P-n22-k2_5$	312.50	45	18.8	71	166.8	78	94.3	95	46.3
$P-n22-k8_5$	763.17	9	0.4	7	1.6	7	0.6	9	0.6
$P-n23-k8_5$	719.00	9	0.4	8	1.5	8	0.7	8	0.7
$P-n40-k5_5$	605.64	36	10.3	65	339.5	65	227.2	114	56.2
$P-n45-k5_5$	610.34	58	95.3	–	–	101	2619.4	–	–
$P-n50-k7_5$	669.51	30	6.4	47	300.3	47	205.4	69	53.2
$P-n50-k8_5$	810.36	37	14.2	72	1360.1	72	954.8	114	364.6
$P-n50-k10_5$	900.80	25	1.8	30	16.3	30	9.8	54	8.3
$P-n51-k10_5$	902.74	28	2.9	37	31.0	37	19.7	69	14.5
$P-n55-k7_5$	741.83	57	34.5	78	753.4	78	528.0	126	162.2
$P-n55-k8_5$	782.46	39	15.3	62	412.6	62	266.2	87	226.4
$P-n55-k10_5$	844.69	27	2.3	28	22.6	28	13.3	48	13.3
$P-n55-k15_5$	1188.37	23	1.8	30	18.6	30	12.2	46	7.7
$P-n60-k10_5$	915.96	34	7.9	71	226.3	71	150.2	84	102.4
$P-n60-k15_5$	1150.60	14	0.9	14	3.2	14	1.7	28	3.1
$P-n65-k10_5$	1028.19	44	12.8	100	738.4	100	503.4	190	334.3
$P-n70-k10_5$	1006.52	50	115.7	–	–	–	–	198	2989.9

EC.3. Detailed results for the selected instances by BPC1 and BPC2

Tables EC.41-EC.59 report the detailed results for the selected instances that can not be solved to optimality in the root node. The columns have the same meaning as in Table 5.

Table EC. 41: Detailed results for the selected instances of class A with $\theta = 0.05$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$A-n36-k5_1$	1081.00	2	19.4	3	24.1	50.00	24.23
$A-n45-k7_1$	1636.00	5	18.4	3	14.7	-40.00	-20.11
$A-n46-k7_1$	1214.50	9	14.4	7	12.3	-22.22	-14.58
$A-n55-k9_1$	1344.50	7	21.7	8	26.7	14.29	23.04
$A-n61-k9_1$	1178.50	15	1285.5	22	1096.3	46.67	-14.72
$A-n63-k9_1$	2234.50	17	310.8	24	393.4	41.18	26.58
$A-n64-k9_1$	1854.00	105	1178.0	163	1738.3	55.24	47.56
$A-n65-k9_1$	1360.00	3	171.0	3	157.6	0.00	-7.84

Table EC. 42: Detailed results for the selected instances of class A with $\theta = 0.10$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$A-n33-k6_2$	966.00	5	6.1	5	6.0	0.00	-1.64
$A-n34-k5_2$	890.00	3	8.2	3	8.1	0.00	-1.22
$A-n36-k5_2$	1125.50	3	17.0	3	15.7	0.00	-7.65
$A-n53-k7_2$	1360.00	3	299.8	3	279.5	0.00	-6.77
$A-n54-k7_2$	1596.00	7	339.0	7	324.3	0.00	-4.34
$A-n55-k9_2$	1387.50	2	11.6	2	11.9	0.00	2.59
$A-n60-k9_2$	1770.00	25	187.4	37	264.2	48.00	40.98
$A-n61-k9_2$	1217.50	21	3124.5	31	2985.3	47.62	-4.46
$A-n63-k9_2$	2317.50	5	241.4	5	204.2	0.00	-15.41
$A-n63-k10_2$	1769.00	9	120.7	12	113.9	33.33	-5.63
$A-n64-k9_2$	1937.00	41	613.4	69	881.3	68.29	43.67
$A-n69-k9_2$	1420.50	17	762.7	11	516.4	-35.29	-32.29

Table EC. 43: Detailed results for the selected instances of class A with $\theta = 0.15$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$A-n45-k7_3$	1633.00	4	25.0	3	24.0	-25.00	-4.00
$A-n53-k7_3$	1381.50	9	503.5	9	448.8	0.00	-10.86
$A-n54-k7_3$	1595.00	3	143.5	5	153.0	66.67	6.62
$A-n55-k9_3$	1444.50	3	19.5	3	18.9	0.00	-3.08
$A-n60-k9_3$	1762.00	7	99.1	7	96.2	0.00	-2.93
$A-n61-k9_3$	1254.50	15	1473.6	19	1586.2	26.67	7.64
$A-n63-k9_3$	2474.50	24	732.3	22	589.8	-8.33	-19.46
$A-n63-k10_3$	1800.00	3	35.8	5	41.3	66.67	15.36
$A-n64-k9_3$	2005.50	39	512.8	87	818.5	123.08	59.61
$A-n65-k9_3$	1449.50	3	184.5	3	185.2	0.00	0.38
$A-n69-k9_3$	1406.00	11	381.9	12	367.8	9.09	-3.69

Table EC. 44: Detailed results for the selected instances of class A with $\theta = 0.20$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$A-n33-k6_4$	965.00	3	5.1	3	5.0	0.00	-1.96
$A-n60-k9_4$	1786.00	4	69.5	5	67.9	25.00	-2.30
$A-n62-k8_4$	1870.50	13	1954.4	11	1834.1	-15.38	-6.16
$A-n64-k9_4$	2072.50	147	1618.4	281	3242.8	91.16	100.37
$A-n65-k9_4$	1502.50	6	351.4	6	428.2	0.00	21.86
$A-n69-k9_4$	1506.00	5	331.7	5	342.3	0.00	3.20
$A-n80-k10_4$	2539.50	7	1616.7	11	2172.7	57.14	34.39

Table EC. 45: Detailed results for the selected instances of class A with $\theta = 0.25$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$A-n37-k6_5$	1370.00	3	27.7	3	28.5	0.00	2.89
$A-n39-k5_5$	1134.00	6	287.3	12	267.1	100.00	-7.03
$A-n45-k7_5$	1779.50	3	49.2	5	65.1	66.67	32.32
$A-n46-k7_5$	1326.00	4	11.0	5	11.5	25.00	4.55
$A-n53-k7_5$	1438.50	3	925.4	3	821.7	0.00	-11.21
$A-n54-k7_5$	1706.00	27	3580.5	29	2423.2	7.41	-32.32
$A-n62-k8_5$	1857.00	13	945.2	17	976.7	30.77	3.33
$A-n63-k9_5$	2558.50	5	230.1	3	176.2	-40.00	-23.42
$A-n63-k10_5$	1877.50	9	172.8	7	129.5	-22.22	-25.06
$A-n64-k9_5$	2104.00	17	472.6	35	665.1	105.88	40.73
$A-n69-k9_5$	1529.50	21	663.2	19	451.7	-9.52	-31.89

Table EC. 46: Detailed results for the selected instances of class B with $\theta = 0.05$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$B-n31-k5_1$	1218.50	5	6.8	3	7.9	-40.00	16.18
$B-n39-k5_1$	990.50	3	34.2	5	50.2	66.67	46.78
$B-n45-k5_1$	927.00	3	902.0	3	901.3	0.00	-0.08
$B-n45-k6_1$	966.50	12	2625.3	19	2241.5	58.33	-14.62
$B-n50-k8_1$	1951.00	4	88.0	5	103.8	25.00	17.95
$B-n56-k7_1$	1286.50	20	169.6	27	231.6	35.00	36.56
$B-n66-k9_1$	2177.50	30	2122.9	5	613.7	-83.33	-71.09
$B-n68-k9_1$	2244.50	3	636.2	3	721.3	0.00	13.38

Table EC. 47: Detailed results for the selected instances of class B with $\theta = 0.10$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$B-n39-k5_2$	1027.00	10	105.8	12	148.7	20.00	40.55
$B-n43-k6_2$	1088.50	3	51.2	3	43.8	0.00	-14.45
$B-n44-k7_2$	1583.00	3	24.0	3	25.7	0.00	7.08
$B-n45-k6_2$	1024.00	7	1946.7	19	3293.3	171.43	69.17
$B-n50-k8_2$	1978.50	3	60.5	3	73.8	0.00	21.98
$B-n56-k7_2$	1327.00	5	56.7	6	75.6	20.00	33.33
$B-n57-k9_2$	3105.00	4	24.1	7	30.7	75.00	27.39
$B-n68-k9_2$	2365.00	35	1968.4	60	2885.4	71.43	46.59

Table EC. 48: Detailed results for the selected instances of class B with $\theta = 0.15$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$B-n45-k6_3$	1011.50	3	743.8	5	918.5	66.67	23.49
$B-n50-k7_3$	1153.50	2	27.1	2	30.6	0.00	12.92
$B-n50-k8_3$	2024.00	4	65.9	3	78.2	-25.00	18.66
$B-n57-k9_3$	3216.00	32	113.2	37	151.6	15.63	33.92
$B-n66-k9_3$	2300.50	7	1714.7	3	1410.6	-57.14	-17.73
$B-n68-k9_3$	2406.50	33	3430.9	–	–	–	–

Table EC. 49: Detailed results for the selected instances of class B with $\theta = 0.20$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$B-n39-k5_4$	1038.50	3	152.9	5	203.7	66.67	33.22
$B-n43-k6_4$	1138.50	6	80.0	7	84.2	16.67	5.25
$B-n44-k7_4$	1641.50	7	25.6	9	37.3	28.57	45.70
$B-n56-k7_4$	1387.50	13	149.6	12	160.1	-7.69	7.02
$B-n66-k9_4$	2336.00	19	3592.1	–	–	–	–
$B-n67-k10_4$	1516.50	167	2795.2	–	–	–	–
$B-n68-k9_4$	2423.00	6	1450.8	5	1366.6	-16.67	-5.80

Table EC. 50: Detailed results for the selected instances of class B with $\theta = 0.25$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$B-n31-k5_5$	1337.00	11	36.2	35	78.5	218.18	116.85
$B-n38-k6_5$	1446.00	4	14.0	6	21.4	50.00	52.86
$B-n43-k6_5$	1151.00	3	25.8	2	23.8	-33.33	-7.75
$B-n44-k7_5$	1696.00	2	22.9	2	25.7	0.00	12.23
$B-n56-k7_5$	1409.00	15	187.5	17	208.3	13.33	11.09
$B-n57-k9_5$	3282.50	9	153.7	24	214.7	166.67	39.69
$B-n63-k10_5$	2970.00	5	442.3	9	516.1	80.00	16.69
$B-n66-k9_5$	2389.50	4	1053.6	4	1068.8	0.00	1.44
$B-n68-k9_5$	2492.00	3	380.6	3	412.5	0.00	8.38

Table EC. 51: Detailed results for the selected instances of class E-F-M with $\theta = 0.05$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$E-n76-k8_1$	779.00	2	1760.6	3	1778.7	50.00	1.03
$E-n76-k14_1$	1162.00	22	88.6	24	89.5	9.09	1.02

Table EC. 52: Detailed results for the selected instances of class E-F-M with $\theta = 0.10$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$E-n76-k7_2$	723.00	8	1940.1	7	1717.6	-12.50	-11.47
$E-n76-k14_2$	1170.50	27	142.7	43	197.8	59.26	38.61
$E-n101-k14_2$	1277.50	155	3028.1	117	2135.7	-24.52	-29.47

Table EC. 53: Detailed results for the selected instances of class E-F-M with $\theta = 0.15$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$E-n76-k14_3$	1182.50	3	42.9	3	39.7	0.00	-7.46

Table EC. 54: Detailed results for the selected instances of class E-F-M with $\theta = 0.25$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$E-n76-k14_5$	1255.00	81	485.8	166	671.2	104.94	38.16

Table EC. 55: Detailed results for the selected instances of class P with $\theta = 0.05$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$P-n22-k8_1$	763.00	3	0.8	3	0.3	0.00	-62.50
$P-n50-k8_1$	777.50	69	3588.3	123	3242.0	78.26	-9.65
$P-n50-k10_1$	868.00	3	8.0	5	11.4	66.67	42.50
$P-n51-k10_1$	839.00	11	29.6	11	35.6	0.00	20.27
$P-n55-k7_1$	688.00	5	50.3	7	62.7	40.00	24.65
$P-n55-k8_1$	758.00	63	2744.4	61	1621.6	-3.17	-40.91
$P-n55-k15_1$	1155.00	9	24.0	9	27.2	0.00	13.33
$P-n60-k10_1$	873.50	6	19.4	5	19.2	-16.67	-1.03
$P-n60-k15_1$	1129.50	5	5.4	7	8.5	40.00	57.41
$P-n65-k10_1$	970.00	43	135.2	36	129.2	-16.28	-4.44
$P-n70-k10_1$	944.50	75	1191.3	119	1601.0	58.67	34.39

Table EC. 56: Detailed results for the selected instances of class P with $\theta = 0.10$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$P-n22-k8_2$	758.00	3	0.6	3	0.4	0.00	-33.33
$P-n50-k7_2$	656.50	8	24.8	10	32.1	25.00	29.44
$P-n51-k10_2$	850.00	7	24.6	9	32.9	28.57	33.74
$P-n55-k7_2$	699.00	5	102.9	7	116.2	40.00	12.93
$P-n55-k15_2$	1177.50	9	23.5	11	34.0	22.22	44.68
$P-n60-k10_2$	902.00	17	53.1	19	62.4	11.76	17.51
$P-n60-k15_2$	1136.00	12	11.2	14	16.6	16.67	48.21
$P-n65-k10_2$	977.50	8	28.1	11	38.6	37.50	37.37
$P-n70-k10_2$	964.00	25	734.2	19	593.3	-24.00	-19.19

Table EC. 57: Detailed results for the selected instances of class P with $\theta = 0.15$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$P-n22-k8_3$	772.00	3	0.8	3	0.5	0.00	-37.50
$P-n50-k7_3$	662.00	3	25.9	3	28.2	0.00	8.88
$P-n50-k10_3$	904.50	5	11.0	8	16.3	60.00	48.18
$P-n51-k10_3$	855.00	9	47.0	7	42.4	-22.22	-9.79
$P-n55-k15_3$	1198.00	3	19.0	4	23.8	33.33	25.26
$P-n60-k15_3$	1165.00	5	6.2	3	6.9	-40.00	11.29
$P-n65-k10_3$	987.50	3	65.8	3	68.6	0.00	4.26

Table EC. 58: Detailed results for the selected instances of class P with $\theta = 0.20$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$P-n22-k8_4$	781.50	3	0.6	3	0.4	0.00	-33.33
$P-n45-k5_4$	589.00	4	128.8	3	127.3	-25.00	-1.16
$P-n50-k7_4$	656.00	4	31.4	4	36.7	0.00	16.88
$P-n50-k10_4$	902.00	5	8.4	5	9.9	0.00	17.86
$P-n51-k10_4$	893.00	36	114.4	36	97.6	0.00	-14.69
$P-n55-k10_4$	832.50	10	7.7	9	9.2	-10.00	19.48
$P-n55-k15_4$	1192.00	47	97.8	89	139.5	89.36	42.64
$P-n60-k15_4$	1172.50	9	6.8	7	8.2	-22.22	20.59
$P-n65-k10_4$	1043.00	33	252.9	49	310.6	48.48	22.82
$P-n70-k10_4$	1008.00	109	2610.3	114	2670.1	4.59	2.29

Table EC. 59: Detailed results for the selected instances of class P with $\theta = 0.25$ by BPC1 and BPC2

Instance	z_{ip}	BPC1		BPC2			
		#Nodes	$t_T(s)$	#Nodes	$t_T(s)$	$\Delta_{Nodes}(\%)$	$\Delta_{t_T}(\%)$
$P-n50-k10_5$	922.50	35	44.3	51	71.4	45.71	61.17
$P-n51-k10_5$	922.00	59	142.6	69	142.4	16.95	-0.14
$P-n55-k7_5$	759.00	24	329.2	21	271.0	-12.50	-17.68
$P-n55-k15_5$	1218.50	27	46.8	33	45.0	22.22	-3.85
$P-n60-k10_5$	934.50	37	151.4	25	103.2	-32.43	-31.84
$P-n70-k10_5$	1030.50	93	2192.9	87	1717	-6.45	-21.70

EC.4. Detailed results for all VRPRD instances

Tables EC.60-EC.79 report the detailed results for all VRPRD instances. The columns have the same meaning as in Table 6.

Table EC. 60: Detailed results for the instances of class A with $\theta = 0.05$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$A-n32-k5_1$	1138.50	1127.17	1138.50	5.0	100.00	3	6	1	5.0
$A-n33-k5_1$	827.50	813.75	827.50	5.1	100.00	18	6	1	5.1
$A-n33-k6_1$	904.50	896.21	904.50	3.0	100.00	7	14	1	3.0
$A-n34-k5_1$	915.00	893.76	915.00	9.6	100.00	22	8	1	9.6
$A-n36-k5_1$	1081.00	1051.30	1080.67	15.0	98.89	8	36	2	19.4
$A-n37-k5_1$	839.00	813.38	839.00	10.6	100.00	13	14	1	10.7
$A-n37-k6_1$	1251.50	1226.00	1251.50	9.9	100.00	25	6	1	9.9
$A-n38-k5_1$	894.00	851.53	894.00	45.3	100.00	34	12	1	45.3
$A-n39-k5_1$	1018.50	1004.50	1018.50	26.8	100.00	18	12	1	26.8
$A-n39-k6_1$	1071.50	1071.50	1071.50	2.0	–	0	0	1	2.0
$A-n44-k6_1$	1147.00	1140.90	1147.00	12.7	100.00	6	6	1	12.7
$A-n45-k6_1$	1122.00	1103.77	1122.00	180.1	100.00	28	24	1	180.1
$A-n45-k7_1$	1636.00	1617.88	1633.92	10.9	88.52	25	18	5	18.4
$A-n46-k7_1$	1214.50	1201.06	1210.00	5.9	66.52	21	12	9	14.4
$A-n48-k7_1$	1406.00	1384.30	1406.00	15.6	100.00	20	24	1	15.6
$A-n53-k7_1$	1325.50	1302.22	1325.50	304.7	100.00	33	36	1	304.7
$A-n54-k7_1$	1532.00	1511.56	1532.00	77.5	100.00	18	26	1	77.5
$A-n55-k9_1$	1344.50	1317.96	1341.16	10.4	87.42	35	18	7	21.7
$A-n60-k9_1$	1731.00	1698.61	1731.00	77.3	100.00	44	26	1	77.3
$A-n61-k9_1$	1178.50	1151.30	1171.21	285.4	73.20	36	36	15	1285.5
$A-n62-k8_1$	1684.00	1664.17	1684.00	165.4	100.00	50	6	1	165.4
$A-n63-k9_1$	2234.50	2203.38	2226.99	123.5	75.87	61	30	17	310.8
$A-n63-k10_1$	1741.00	1714.65	1741.00	32.4	100.00	20	20	1	32.4
$A-n64-k9_1$	1854.00	1818.20	1841.20	55.9	64.25	21	30	105	1178.0
$A-n65-k9_1$	1360.00	1335.38	1358.98	134.8	95.86	47	36	3	171.0

Table EC. 61: Detailed results for the instances of class A with $\theta = 0.10$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$A-n32-k5_2$	1111.00	1111.00	1111.00	1.0	–	0	0	1	1.0
$A-n33-k5_2$	849.50	825.83	849.50	4.7	100.00	20	8	1	4.7
$A-n33-k6_2$	966.00	950.55	963.58	3.3	84.34	8	18	5	6.1
$A-n34-k5_2$	890.00	862.41	889.13	6.2	96.84	17	12	3	8.2
$A-n36-k5_2$	1125.50	1098.07	1124.73	10.8	97.19	10	18	3	17.0
$A-n37-k5_2$	860.50	831.25	860.50	14.5	100.00	8	24	1	14.5
$A-n37-k6_2$	1244.00	1215.46	1244.00	18.3	100.00	22	18	1	18.3
$A-n38-k5_2$	888.00	851.34	888.00	50.5	100.00	23	14	1	50.6
$A-n39-k5_2$	1034.50	1020.71	1034.50	55.2	100.00	16	6	1	55.2
$A-n39-k6_2$	1123.00	1117.25	1123.00	3.5	100.00	3	2	1	3.5
$A-n44-k6_2$	1177.00	1170.29	1177.00	12.1	100.00	10	6	1	12.1
$A-n45-k6_2$	1108.00	1098.32	1108.00	88.5	100.00	25	4	1	88.5
$A-n45-k7_2$	1644.00	1626.08	1644.00	6.6	100.00	18	6	1	6.6
$A-n46-k7_2$	1211.00	1197.50	1211.00	6.9	100.00	22	18	1	6.9
$A-n48-k7_2$	1492.50	1465.00	1492.50	20.3	100.00	18	20	1	20.3
$A-n53-k7_2$	1360.00	1330.17	1358.40	233.6	94.64	38	36	3	299.8
$A-n54-k7_2$	1596.00	1568.46	1592.54	152.1	87.44	22	42	7	339.0
$A-n55-k9_2$	1387.50	1364.23	1387.29	10.3	99.10	33	12	2	11.6
$A-n60-k9_2$	1770.00	1731.66	1761.70	44.2	78.35	38	24	25	187.4
$A-n61-k9_2$	1217.50	1174.13	1208.82	828.2	79.99	60	49	21	3124.5
$A-n62-k8_2$	1765.50	1757.05	1765.50	176.8	100.00	28	6	1	176.8
$A-n63-k9_2$	2317.50	2285.87	2314.17	143.7	89.47	48	48	5	241.4
$A-n63-k10_2$	1769.00	1735.13	1766.01	48.1	91.17	28	36	9	120.7
$A-n64-k9_2$	1937.00	1904.07	1928.24	85.3	73.40	14	30	41	613.4
$A-n65-k9_2$	1429.50	1402.72	1429.50	186.9	100.00	49	18	1	186.9
$A-n69-k9_2$	1420.50	1377.69	1413.47	222.4	83.58	45	42	17	762.7

Table EC. 62: Detailed results for the instances of class A with $\theta = 0.15$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$A-n32-k5_3$	1139.50	1136.63	1139.50	1.3	100.00	1	0	1	1.3
$A-n33-k5_3$	828.00	807.42	828.00	7.7	100.00	22	14	1	7.7
$A-n33-k6_3$	936.00	930.00	936.00	2.4	100.00	8	2	1	2.4
$A-n34-k5_3$	951.50	936.21	951.50	8.8	100.00	21	2	1	8.8
$A-n36-k5_3$	1115.50	1094.75	1115.50	7.9	100.00	5	20	1	7.9
$A-n37-k5_3$	879.50	847.87	879.50	23.8	100.00	10	22	1	23.8
$A-n37-k6_3$	1320.50	1300.17	1320.50	13.0	100.00	21	16	1	13.1
$A-n38-k5_3$	895.50	848.11	895.50	68.4	100.00	27	24	1	68.4
$A-n39-k5_3$	1090.00	1072.52	1090.00	58.7	100.00	12	14	1	58.7
$A-n39-k6_3$	1158.00	1158.00	1158.00	2.3	–	0	0	1	2.3
$A-n44-k6_3$	1195.50	1180.94	1195.50	28.0	100.00	15	24	1	28.0
$A-n45-k6_3$	1154.00	1134.75	1154.00	227.3	100.00	17	18	1	227.4
$A-n45-k7_3$	1633.00	1614.17	1630.96	17.1	89.17	32	24	4	25.0
$A-n46-k7_3$	1245.00	1238.33	1245.00	3.7	100.00	1	10	1	3.7
$A-n48-k7_3$	1483.50	1468.75	1483.50	8.2	100.00	10	0	1	8.2
$A-n53-k7_3$	1381.50	1350.21	1376.86	182.0	85.17	32	30	9	503.5
$A-n54-k7_3$	1595.00	1575.56	1592.87	103.2	89.04	26	24	3	143.5
$A-n55-k9_3$	1444.50	1418.25	1443.18	14.9	94.97	39	24	3	19.5
$A-n60-k9_3$	1762.00	1723.09	1757.93	62.1	89.54	48	30	7	99.1
$A-n61-k9_3$	1254.50	1216.06	1248.50	445.5	84.39	39	48	15	1473.6
$A-n62-k8_3$	1746.00	1730.78	1746.00	240.3	100.00	40	8	1	240.3
$A-n63-k9_3$	2474.50	2434.97	2464.01	146.8	73.46	39	36	24	732.3
$A-n63-k10_3$	1800.00	1778.74	1797.55	28.4	88.48	12	24	3	35.8
$A-n64-k9_3$	2005.50	1973.66	1995.77	60.0	69.44	19	18	39	512.8
$A-n65-k9_3$	1449.50	1421.83	1446.00	160.6	87.35	35	12	3	184.5
$A-n69-k9_3$	1406.00	1380.82	1399.77	159.8	75.26	26	24	11	381.9

Table EC. 63: Detailed results for the instances of class A with $\theta = 0.20$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$A-n32-k5_4$	1188.00	1185.83	1188.00	1.6	100.00	2	2	1	1.6
$A-n33-k5_4$	887.50	876.08	887.50	4.2	100.00	9	2	1	4.2
$A-n33-k6_4$	965.00	955.60	964.20	3.8	91.49	7	18	3	5.1
$A-n34-k5_4$	927.00	903.19	927.00	14.1	100.00	20	14	1	14.2
$A-n36-k5_4$	1079.00	1055.58	1079.00	16.2	100.00	9	24	1	16.2
$A-n37-k5_4$	875.00	838.80	875.00	24.8	100.00	17	22	1	24.8
$A-n37-k6_4$	1319.50	1293.11	1319.50	20.7	100.00	15	34	1	20.7
$A-n38-k5_4$	995.00	962.49	995.00	65.1	100.00	21	18	1	65.1
$A-n39-k5_4$	1181.50	1156.15	1181.50	164.3	100.00	19	34	1	164.3
$A-n39-k6_4$	1156.50	1156.50	1156.50	2.2	–	0	0	1	2.2
$A-n44-k6_4$	1200.50	1182.77	1200.50	42.5	100.00	11	16	1	42.5
$A-n45-k6_4$	1184.50	1160.67	1184.50	289.3	100.00	20	16	1	289.3
$A-n45-k7_4$	1747.50	1732.37	1747.50	9.2	100.00	19	6	1	9.2
$A-n46-k7_4$	1255.00	1252.35	1255.00	2.6	100.00	1	6	1	2.6
$A-n48-k7_4$	1516.50	1496.42	1516.50	20.1	100.00	14	14	1	20.1
$A-n53-k7_4$	1405.00	1376.97	1405.00	444.5	100.00	28	42	1	444.5
$A-n55-k9_4$	1436.50	1413.69	1436.50	18.0	100.00	35	14	1	18.0
$A-n60-k9_4$	1786.00	1758.60	1784.54	49.4	94.67	48	12	4	69.5
$A-n62-k8_4$	1870.50	1842.07	1866.97	640.8	87.58	29	36	13	1954.4
$A-n63-k9_4$	2384.50	2370.99	2384.50	110.9	100.00	23	18	1	110.9
$A-n63-k10_4$	1833.50	1811.28	1833.50	33.9	100.00	34	18	1	34.0
$A-n64-k9_4$	2072.50	2035.84	2052.54	63.7	45.55	21	12	147	1618.4
$A-n65-k9_4$	1502.50	1472.94	1496.22	280.4	78.76	48	18	6	351.4
$A-n69-k9_4$	1506.00	1479.77	1503.60	232.7	90.85	31	30	5	331.7
$A-n80-k10_4$	2539.50	2504.54	2536.01	875.8	90.02	22	42	7	1616.7

Table EC. 64: Detailed results for the instances of class A with $\theta = 0.25$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$A-n32-k5_5$	1177.50	1156.60	1177.50	3.7	100.00	6	6	1	3.7
$A-n33-k5_5$	945.00	921.65	945.00	5.2	100.00	11	10	1	5.2
$A-n33-k6_5$	951.00	941.36	951.00	2.6	100.00	8	8	1	2.6
$A-n34-k5_5$	956.00	925.62	956.00	18.2	100.00	25	18	1	18.2
$A-n36-k5_5$	1156.50	1138.25	1156.50	6.6	100.00	4	12	1	6.6
$A-n37-k5_5$	854.00	832.00	854.00	13.4	100.00	13	6	1	13.4
$A-n37-k6_5$	1370.00	1335.12	1369.38	19.5	98.22	19	24	3	27.7
$A-n38-k5_5$	969.00	922.33	969.00	94.0	100.00	20	24	1	94.0
$A-n39-k5_5$	1134.00	1107.12	1128.76	94.1	80.51	11	24	12	287.3
$A-n39-k6_5$	1192.50	1192.50	1192.50	2.9	–	0	0	1	2.9
$A-n44-k6_5$	1209.00	1195.63	1209.00	28.3	100.00	14	14	1	28.3
$A-n45-k6_5$	1185.00	1149.25	1185.00	300.2	100.00	30	16	1	300.2
$A-n45-k7_5$	1779.50	1755.04	1776.92	37.8	89.45	24	36	3	49.2
$A-n46-k7_5$	1326.00	1307.67	1324.81	7.4	93.51	8	24	4	11.0
$A-n48-k7_5$	1530.00	1509.21	1530.00	13.2	100.00	13	4	1	13.2
$A-n53-k7_5$	1438.50	1402.72	1436.66	571.4	94.86	30	49	3	925.4
$A-n54-k7_5$	1706.00	1670.89	1694.83	400.6	68.19	20	36	27	3580.5
$A-n55-k9_5$	1462.50	1432.66	1462.50	19.4	100.00	38	24	1	19.4
$A-n60-k9_5$	1873.50	1838.45	1873.50	54.3	100.00	29	14	1	54.3
$A-n62-k8_5$	1857.00	1832.64	1851.72	358.8	78.33	27	12	13	945.2
$A-n63-k9_5$	2558.50	2533.70	2555.44	149.2	87.66	27	24	5	230.1
$A-n63-k10_5$	1877.50	1849.63	1872.37	76.1	81.59	24	48	9	172.8
$A-n64-k9_5$	2104.00	2077.46	2095.76	112.5	68.95	16	42	17	472.6
$A-n65-k9_5$	1521.50	1519.32	1521.50	160.7	100.00	5	0	1	160.7
$A-n69-k9_5$	1529.50	1503.68	1523.18	160.8	75.52	25	30	21	663.2

Table EC. 65: Detailed results for the instances of class B with $\theta = 0.05$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$B-n31-k5_1$	1218.50	1206.83	1217.50	4.0	91.43	11	6	5	6.8
$B-n34-k5_1$	1252.00	1232.71	1252.00	23.9	100.00	20	2	1	23.9
$B-n35-k5_1$	1831.00	1661.93	1831.00	3.3	100.00	14	6	1	3.3
$B-n38-k6_1$	1298.00	1241.92	1298.00	4.1	100.00	12	8	1	4.1
$B-n39-k5_1$	990.50	950.67	987.44	27.2	92.31	12	6	3	34.2
$B-n41-k6_1$	1317.00	1251.81	1317.00	16.9	100.00	8	12	1	16.9
$B-n43-k6_1$	1058.00	1038.29	1058.00	9.5	100.00	9	0	1	9.5
$B-n44-k7_1$	1526.50	1446.03	1526.50	9.6	100.00	12	18	1	9.6
$B-n45-k5_1$	927.00	848.05	925.74	697.8	98.40	29	12	3	902.0
$B-n45-k6_1$	966.50	938.34	959.46	697.6	74.98	23	30	12	2625.3
$B-n50-k7_1$	1098.50	1010.81	1098.50	9.8	100.00	22	10	1	9.8
$B-n50-k8_1$	1951.00	1915.34	1950.34	64.3	98.15	36	24	4	88.0
$B-n52-k7_1$	1367.50	1306.93	1367.50	56.4	100.00	6	0	1	56.4
$B-n56-k7_1$	1286.50	1203.60	1282.63	37.1	95.33	14	12	20	169.6
$B-n57-k7_1$	2046.00	2802.51	2046.00	3474.3	100.00	22	8	1	3474.3
$B-n57-k9_1$	3038.00	2998.59	3038.00	11.0	100.00	21	10	1	11.0
$B-n63-k10_1$	2725.00	2681.69	2725.00	62.2	100.00	42	12	1	62.2
$B-n66-k9_1$	2177.50	2140.14	2171.51	333.2	83.97	25	12	30	2122.9
$B-n68-k9_1$	2244.50	2175.99	2243.82	550.1	99.01	35	24	3	636.2

Table EC. 66: Detailed results for the instances of class B with $\theta = 0.10$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$B-n31-k5_2$	1243.00	1238.20	1243.00	2.3	100.00	4	2	1	2.3
$B-n34-k5_2$	1276.50	1250.57	1276.50	21.3	100.00	14	4	1	21.3
$B-n35-k5_2$	1803.00	1640.71	1803.00	2.4	100.00	9	6	1	2.4
$B-n38-k6_2$	1303.00	1257.28	1303.00	2.5	100.00	6	0	1	2.5
$B-n39-k5_2$	1027.00	985.64	1020.93	33.9	85.32	12	6	10	105.8
$B-n41-k6_2$	1271.50	1258.52	1271.50	15.6	100.00	6	0	1	15.6
$B-n43-k6_2$	1088.50	1056.46	1087.33	27.9	96.35	19	18	3	51.2
$B-n44-k7_2$	1583.00	1500.35	1582.40	19.5	99.27	22	12	3	24.0
$B-n45-k5_2$	917.00	843.00	917.00	994.3	100.00	21	4	1	994.3
$B-n45-k6_2$	1024.00	994.22	1019.13	910.1	83.65	21	30	7	1946.7
$B-n50-k7_2$	1121.50	1047.07	1121.50	7.0	100.00	8	2	1	7.0
$B-n50-k8_2$	1978.50	1945.60	1977.54	50.7	97.08	27	18	3	60.5
$B-n51-k7_2$	1612.00	1506.47	1612.00	989.0	100.00	49	14	1	989.0
$B-n52-k7_2$	1364.00	1310.88	1364.00	119.7	100.00	6	0	1	119.7
$B-n56-k7_2$	1327.00	1249.98	1324.90	41.2	97.27	12	18	5	56.7
$B-n57-k9_2$	3105.00	3073.45	3103.19	13.9	94.26	14	12	4	24.1
$B-n63-k10_2$	2799.50	2751.36	2799.50	102.7	100.00	46	14	1	102.7
$B-n68-k9_2$	2365.00	2301.60	2357.32	301.3	87.89	25	12	35	1968.4

Table EC. 67: Detailed results for the instances of class B with $\theta = 0.15$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$B-n31-k5_3$	1265.50	1254.03	1265.50	5.3	100.00	9	12	1	5.3
$B-n34-k5_3$	1302.50	1282.89	1302.50	24.2	100.00	7	2	1	24.2
$B-n35-k5_3$	1921.00	1785.36	1921.00	31.3	100.00	15	26	1	31.3
$B-n38-k6_3$	1387.50	1336.58	1387.50	3.7	100.00	13	2	1	3.7
$B-n39-k5_3$	1022.50	986.04	1022.50	76.1	100.00	15	6	1	76.1
$B-n41-k6_3$	1294.00	1271.26	1294.00	17.7	100.00	9	6	1	17.7
$B-n43-k6_3$	1133.00	1115.44	1133.00	11.7	100.00	6	0	1	11.7
$B-n44-k7_3$	1546.50	1486.19	1546.50	6.4	100.00	5	0	1	6.4
$B-n45-k5_3$	939.00	850.10	939.00	1667.5	100.00	23	20	1	1667.5
$B-n45-k6_3$	1011.50	988.25	1010.78	541.4	96.90	20	24	3	743.8
$B-n50-k7_3$	1153.50	1071.77	1153.42	23.5	99.90	10	10	2	27.1
$B-n50-k8_3$	2024.00	1993.33	2023.54	44.1	98.50	29	24	4	65.9
$B-n52-k7_3$	1452.00	1387.42	1452.00	139.9	100.00	16	0	1	139.9
$B-n56-k7_3$	1330.00	1254.05	1330.00	49.2	100.00	8	6	1	49.2
$B-n57-k9_3$	3216.00	3174.89	3210.31	19.0	86.16	15	24	32	113.2
$B-n63-k10_3$	2869.50	2822.77	2869.50	155.7	100.00	28	36	1	155.7
$B-n66-k9_3$	2300.50	2278.16	2295.99	978.2	79.81	32	18	7	1714.7
$B-n68-k9_3$	2406.50	2342.75	2398.69	496.0	87.75	27	18	33	3430.9

Table EC. 68: Detailed results for the instances of class B with $\theta = 0.20$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$B-n31-k5_4$	1308.50	1299.57	1308.50	4.1	100.00	4	6	1	4.1
$B-n34-k5_4$	1306.00	1302.07	1306.00	15.4	100.00	5	0	1	15.4
$B-n35-k5_4$	1884.00	1750.49	1884.00	24.3	100.00	15	20	1	24.3
$B-n38-k6_4$	1389.50	1338.28	1389.50	4.0	100.00	13	10	1	4.0
$B-n39-k5_4$	1038.50	994.18	1036.75	104.2	96.05	15	18	3	152.9
$B-n41-k6_4$	1316.00	1297.84	1316.00	28.2	100.00	5	6	1	28.2
$B-n43-k6_4$	1138.50	1109.58	1133.61	44.8	83.09	19	18	6	80.0
$B-n44-k7_4$	1641.50	1565.42	1639.14	13.0	96.90	9	12	7	25.6
$B-n45-k5_4$	987.50	905.04	987.50	1395.5	100.00	27	8	1	1395.5
$B-n45-k6_4$	1060.50	1055.17	1060.50	115.5	100.00	3	0	1	115.5
$B-n50-k7_4$	1191.00	1115.85	1191.00	8.6	100.00	10	2	1	8.6
$B-n50-k8_4$	2040.50	2020.39	2040.50	47.6	100.00	47	16	1	47.6
$B-n51-k7_4$	1753.00	1661.82	1753.00	717.1	100.00	37	6	1	717.1
$B-n52-k7_4$	1499.50	1438.48	1499.50	114.3	100.00	9	0	1	114.3
$B-n56-k7_4$	1387.50	1304.87	1384.32	55.0	96.15	12	18	13	149.6
$B-n57-k7_4$	2237.00	2205.61	2237.00	2909.4	100.00	13	0	1	2909.4
$B-n57-k9_4$	3193.00	3171.60	3193.00	15.7	100.00	14	16	1	15.7
$B-n63-k10_4$	2895.00	2851.98	2895.00	126.6	100.00	32	24	1	126.7
$B-n66-k9_4$	2336.00	2299.82	2325.06	730.2	69.76	31	18	19	3592.1
$B-n67-k10_4$	1516.50	1435.44	1501.57	69.5	81.58	35	30	167	2795.2
$B-n68-k9_4$	2423.00	2369.57	2421.63	823.2	97.44	26	24	6	1450.8

Table EC. 69: Detailed results for the instances of class B with $\theta = 0.25$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$B-n31-k5_5$	1337.00	1327.00	1330.94	6.2	39.40	1	12	11	36.2
$B-n34-k5_5$	1380.50	1376.27	1380.50	25.2	100.00	8	2	1	25.2
$B-n35-k5_5$	1926.00	1780.50	1926.00	3.5	100.00	11	4	1	3.5
$B-n38-k6_5$	1446.00	1386.00	1441.92	9.9	93.20	16	30	4	14.0
$B-n39-k5_5$	1021.00	985.34	1021.00	17.3	100.00	8	0	1	17.3
$B-n41-k6_5$	1391.50	1362.19	1391.50	27.7	100.00	5	12	1	27.7
$B-n43-k6_5$	1151.00	1121.36	1150.91	18.6	99.70	15	6	3	25.8
$B-n44-k7_5$	1696.00	1617.35	1695.83	19.5	99.78	10	18	2	22.9
$B-n45-k5_5$	1014.00	926.82	1014.00	1117.4	100.00	16	12	1	1117.4
$B-n45-k6_5$	1114.50	1101.52	1114.50	328.7	100.00	12	12	1	328.8
$B-n50-k7_5$	1246.50	1174.86	1246.50	14.2	100.00	10	12	1	14.2
$B-n50-k8_5$	2108.00	2096.31	2108.00	27.0	100.00	19	8	1	27.0
$B-n51-k7_5$	1835.50	1733.36	1835.50	2306.7	100.00	17	30	1	2306.7
$B-n52-k7_5$	1531.50	1463.59	1531.50	865.3	100.00	13	18	1	865.3
$B-n56-k7_5$	1409.00	1322.99	1404.90	40.0	95.23	9	12	15	187.5
$B-n57-k9_5$	3282.50	3247.77	3275.65	38.5	80.28	16	36	9	153.7
$B-n63-k10_5$	2970.00	2915.58	2967.06	175.0	94.60	30	30	5	442.3
$B-n66-k9_5$	2389.50	2353.05	2387.44	774.4	94.35	27	30	4	1053.6
$B-n68-k9_5$	2492.00	2443.59	2491.27	314.7	98.49	21	18	3	380.6

Table EC. 70: Detailed results for the instances of class E-F-M with $\theta = 0.05$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$E-n51-k5_1$	568.00	563.22	568.00	1610.8	100.00	9	8	1	1610.8
$E-n76-k8_1$	779.00	769.69	778.52	1630.2	94.88	14	30	2	1760.6
$E-n76-k14_1$	1162.00	1147.23	1157.92	24.4	72.38	22	12	22	88.6
$M-n101-k10_1$	942.00	942.00	942.00	613.3	–	0	0	1	613.3

Table EC. 71: Detailed results for the instances of class E-F-M with $\theta = 0.10$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$E-n51-k5_2$	614.00	606.11	614.00	3133.9	100.00	6	18	1	3134.0
$E-n76-k7_2$	723.00	715.68	720.69	922.3	68.38	3	18	8	1940.1
$E-n76-k14_2$	1170.50	1152.53	1164.60	41.1	67.17	29	36	27	142.7
$E-n101-k14_2$	1277.50	1259.77	1271.45	129.1	65.88	23	36	155	3028.1
$M-n101-k10_2$	953.50	953.50	953.50	1590.3	–	0	0	1	1590.3

Table EC. 72: Detailed results for the instances of class E-F-M with $\theta = 0.15$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$E-n51-k5_3$	632.00	624.56	632.00	2851.0	100.00	12	12	1	2851.0
$E-n76-k14_3$	1182.50	1172.97	1182.22	35.2	97.06	25	24	3	42.9
$F-n45-k4_3$	845.00	835.00	845.00	2585.3	100.00	0	6	1	2585.3
$M-n101-k10_3$	1017.00	1013.17	1017.00	1409.1	100.00	1	6	1	1409.1

Table EC. 73: Detailed results for the instances of class E-F-M with $\theta = 0.20$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$E-n76-k14_4$	1196.50	1191.06	1196.50	31.1	100.00	22	14	1	31.1
$M-n101-k10_4$	1031.50	1031.50	1031.50	1013.8	–	0	0	1	1013.8

Table EC. 74: Detailed results for the instances of class E-F-M with $\theta = 0.25$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$E-n76-k14_5$	1255.00	1234.95	1245.64	45.4	53.32	29	36	81	485.8
$M-n101-k10_5$	1056.50	1056.50	1056.50	1351.3	–	0	0	1	1351.3

Table EC. 75: Detailed results for the instances of class P with $\theta = 0.05$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$P-n16-k8_1$	589.00	588.17	589.00	0.6	100.00	3	0	1	0.6
$P-n19-k2_1$	321.50	312.75	321.50	18.4	100.00	2	6	1	18.4
$P-n20-k2_1$	278.50	278.17	278.50	15.9	100.00	2	0	1	15.9
$P-n21-k2_1$	290.00	290.00	290.00	11.2	–	0	0	1	11.2
$P-n22-k2_1$	301.50	301.50	301.50	16.7	–	0	0	1	16.7
$P-n22-k8_1$	763.00	730.00	761.17	0.7	94.45	7	8	3	0.8
$P-n23-k8_1$	680.00	680.00	680.00	0.5	–	0	0	1	0.5
$P-n40-k5_1$	550.50	550.50	550.50	8.5	–	0	0	1	8.5
$P-n45-k5_1$	585.00	579.06	585.00	134.5	100.00	5	12	1	134.5
$P-n50-k7_1$	638.50	633.19	638.50	11.6	100.00	14	6	1	11.6
$P-n50-k8_1$	777.50	744.86	761.92	114.1	52.27	36	36	69	3588.3
$P-n50-k10_1$	868.00	854.17	865.96	6.5	85.23	32	30	3	8.0
$P-n51-k10_1$	839.00	828.06	834.89	11.3	62.47	30	18	11	29.6
$P-n55-k7_1$	688.00	682.97	686.38	29.5	67.69	10	6	5	50.3
$P-n55-k8_1$	758.00	727.20	745.95	138.3	60.89	38	30	63	2744.4
$P-n55-k10_1$	792.00	790.32	792.00	3.9	100.00	18	2	1	3.9
$P-n55-k15_1$	1155.00	1128.35	1147.49	12.3	71.82	47	42	9	24.0
$P-n60-k10_1$	873.50	864.89	871.91	11.5	81.56	16	18	6	19.4
$P-n60-k15_1$	1129.50	1122.18	1128.00	3.7	79.51	52	26	5	5.4
$P-n65-k10_1$	970.00	956.35	962.60	19.1	45.82	16	18	43	135.2
$P-n70-k10_1$	944.50	924.36	935.40	123.8	54.80	41	30	75	1191.3

Table EC. 76: Detailed results for the instances of class P with $\theta = 0.10$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$P-n16-k8_2$	595.00	594.50	595.00	0.4	100.00	2	0	1	0.4
$P-n19-k2_2$	325.00	316.00	325.00	54.1	100.00	2	8	1	54.1
$P-n20-k2_2$	300.00	293.00	300.00	58.5	100.00	3	4	1	58.5
$P-n21-k2_2$	292.50	292.50	292.50	9.3	–	0	0	1	9.3
$P-n22-k2_2$	286.00	286.00	286.00	25.3	–	0	0	1	25.3
$P-n22-k8_2$	758.00	727.75	756.33	0.5	94.49	10	8	3	0.6
$P-n23-k8_2$	706.00	706.00	706.00	0.5	–	0	0	1	0.5
$P-n40-k5_2$	598.00	592.80	598.00	21.7	100.00	4	12	1	21.7
$P-n45-k5_2$	572.00	566.97	572.00	127.9	100.00	10	12	1	127.9
$P-n50-k7_2$	656.50	649.43	653.28	12.9	54.47	24	6	8	24.8
$P-n50-k10_2$	852.00	841.40	852.00	6.5	100.00	31	26	1	6.5
$P-n51-k10_2$	850.00	834.98	846.99	11.7	79.95	24	30	7	24.6
$P-n55-k7_2$	699.00	686.55	697.37	58.1	86.88	14	30	5	102.9
$P-n55-k10_2$	807.00	800.48	807.00	4.5	100.00	28	8	1	4.5
$P-n55-k15_2$	1177.50	1148.88	1168.55	12.6	68.73	42	42	9	23.5
$P-n60-k10_2$	902.00	887.83	896.08	14.2	58.18	18	30	17	53.1
$P-n60-k15_2$	1136.00	1123.59	1132.00	5.0	67.77	42	42	12	11.2
$P-n65-k10_2$	977.50	967.87	974.80	14.1	71.93	21	12	8	28.1
$P-n70-k10_2$	964.00	948.54	958.93	164.1	67.19	48	36	25	734.2

Table EC. 77: Detailed results for the instances of class P with $\theta = 0.15$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$P-n16-k8_3$	602.00	600.00	602.00	0.5	100.00	3	0	1	0.5
$P-n19-k2_3$	327.50	319.14	327.50	28.4	100.00	4	2	1	28.4
$P-n20-k2_3$	303.00	301.33	303.00	14.9	100.00	1	0	1	14.9
$P-n21-k2_3$	275.50	275.50	275.50	12.6	–	0	0	1	12.6
$P-n22-k2_3$	302.00	302.00	302.00	31.9	–	0	0	1	31.9
$P-n22-k8_3$	772.00	740.80	768.33	0.7	88.25	16	10	3	0.8
$P-n23-k8_3$	708.50	708.50	708.50	0.5	–	0	0	1	0.5
$P-n40-k5_3$	597.50	592.13	597.50	25.5	100.00	2	10	1	25.5
$P-n45-k5_3$	593.00	584.48	593.00	424.9	100.00	9	18	1	424.9
$P-n50-k7_3$	662.00	652.18	661.43	18.8	94.24	18	18	3	25.9
$P-n50-k10_3$	904.50	887.84	901.49	6.6	81.93	29	24	5	11.0
$P-n51-k10_3$	855.00	838.98	852.38	20.8	83.65	48	49	9	47.0
$P-n55-k7_3$	706.00	699.06	706.00	75.9	100.00	16	22	1	75.9
$P-n55-k10_3$	837.50	831.11	837.50	4.5	100.00	22	8	1	4.5
$P-n55-k15_3$	1198.00	1178.09	1195.48	15.2	87.34	50	48	3	19.0
$P-n60-k10_3$	868.00	863.42	868.00	12.3	100.00	23	6	1	12.3
$P-n60-k15_3$	1165.00	1157.39	1163.39	4.4	78.84	50	18	5	6.2
$P-n65-k10_3$	987.50	976.70	986.86	49.7	94.07	31	36	3	65.8

Table EC. 78: Detailed results for the instances of class P with $\theta = 0.20$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$P-n16-k8_4$	607.00	604.33	607.00	0.4	100.00	4	0	1	0.4
$P-n19-k2_4$	332.00	328.23	332.00	11.6	100.00	2	2	1	11.6
$P-n20-k2_4$	305.00	305.00	305.00	20.9	–	0	0	1	20.9
$P-n21-k2_4$	307.50	307.50	307.50	21.3	–	0	0	1	21.3
$P-n22-k2_4$	329.00	329.00	329.00	23.0	–	0	0	1	23.0
$P-n22-k8_4$	781.50	747.50	778.67	0.5	91.67	11	4	3	0.6
$P-n23-k8_4$	698.00	698.00	698.00	0.5	–	0	0	1	0.5
$P-n40-k5_4$	613.50	606.82	613.50	27.9	100.00	3	8	1	27.9
$P-n45-k5_4$	589.00	585.25	587.48	86.5	59.36	5	6	4	128.8
$P-n50-k7_4$	656.00	648.50	655.78	22.3	97.05	16	24	4	31.4
$P-n50-k10_4$	902.00	885.13	899.16	5.4	83.16	26	30	5	8.4
$P-n51-k10_4$	893.00	874.08	885.84	16.6	62.18	21	30	36	114.4
$P-n55-k7_4$	721.00	712.25	721.00	69.0	100.00	18	18	1	69.0
$P-n55-k10_4$	832.50	825.40	830.19	3.1	67.49	17	6	10	7.7
$P-n55-k15_4$	1192.00	1158.07	1176.01	12.3	52.87	42	36	47	97.8
$P-n60-k10_4$	876.50	876.50	876.50	3.2	–	0	0	1	3.2
$P-n60-k15_4$	1172.50	1161.69	1170.02	3.4	77.06	37	24	9	6.8
$P-n65-k10_4$	1043.00	1026.85	1036.27	39.8	58.33	14	36	33	252.9
$P-n70-k10_4$	1008.00	980.41	996.88	192.8	59.71	26	30	109	2610.3

Table EC. 79: Detailed results for the instances of class P with $\theta = 0.25$

Instance	z_{ip}	z_{lp}	z_{lp_c}	$t_{root}(s)$	$\Delta_{lp_c}(\%)$	#CC	#SR	#Nodes	$t_T(s)$
$P-n16-k8_5$	616.5	614.33	616.50	0.5	100.00	4	0	1	0.5
$P-n19-k2_5$	357.5	350.00	357.50	19.4	100.00	1	0	1	19.4
$P-n20-k2_5$	314.0	300.25	314.00	62.0	100.00	1	6	1	62.0
$P-n21-k2_5$	319.5	319.50	319.50	14.4	–	0	0	1	14.4
$P-n22-k2_5$	312.5	312.50	312.50	17.7	–	0	0	1	17.7
$P-n22-k8_5$	790.0	763.17	790.00	0.5	100.00	12	3	1	0.5
$P-n23-k8_5$	719.0	719.00	719.00	0.5	–	0	0	1	0.5
$P-n40-k5_5$	614.5	605.64	614.50	36.2	100.00	5	18	1	36.2
$P-n50-k7_5$	678.5	669.51	678.50	38.5	100.00	20	18	1	38.5
$P-n50-k10_5$	922.5	900.80	913.68	6.3	59.36	25	24	35	44.3
$P-n51-k10_5$	922.0	902.74	912.43	9.5	50.31	19	18	59	142.6
$P-n55-k7_5$	759.0	741.83	751.75	55.1	57.76	10	12	24	329.2
$P-n55-k10_5$	848.5	844.69	848.50	5.4	100.00	17	6	1	5.4
$P-n55-k15_5$	1218.5	1188.37	1206.77	9.0	61.07	35	24	27	46.8
$P-n60-k10_5$	934.5	915.96	928.84	21.7	69.45	19	30	37	151.4
$P-n60-k15_5$	1159.0	1150.60	1159.00	2.7	100.00	34	10	1	2.7
$P-n65-k10_5$	1040.5	1028.19	1040.50	45.8	100.00	28	42	1	45.8
$P-n70-k10_5$	1030.5	1006.52	1018.19	214.5	48.67	29	36	93	2192.9