A   Results of DIMACS instances

A.1   Objective bounds of the unsolved instances by POP1 or POP1R

Instance	$|V|$	$|E|$	Opt	POP1 lb	POP1 ub	POP1 Time[s]	POP1R lb	POP1R ub	POP1R Time[s]
C18-10-1000-5	500	12500	318.0	318.0	318.0	4365.51	318.0	320.0	10805.81
C20-100-1000-5	500	12500	4768.0	4768.0	4830.0	10808.90	4768.0	4897.0	10804.77
C20-10-1000-5	500	12500	460.0	457.0	469.0	10808.75	457.0	470.0	10804.85

A.2   Strength of the LP relaxation

s_{POP}: strength (LP/OPT) of the basic model of POP

s_{SL}: strength (LP/OPT) of the basic model *"sNODE-HOP"* of Sinnl-Ljubić

$(|V|, |E|)$	s_{POP}	s_{SL}
(50,63)	1.57234625	1.58200542
(50,100)	1.08009000	1.08067417
(75,94)	2.25153167	2.27047708
(75,150)	1.30335042	1.30501250
(100,125)	1.55867542	1.56920250
(100,200)	1.48682500	1.48936542
(500,625)	1.41726117	1.41844117
(500,1000)	1.09830350	1.09940650
(500,2500)	1.01934767	1.01947050
(500,12500)	1.01247111	1.01249911

H	s_{POP}	s_{SL}
3	2.98347278	3.01212306
5	1.34991289	1.35152433
6	1.10631972	1.10689056
9	1.04166361	1.04172139
12	1.03708972	1.03708972
15	1.01063967	1.01065889
25	1.00852678	1.00852800

A.3 Running times for all 414 DIMACS instances

$|V'|$,$|E'|$: number of nodes and edges after EURC reduction

SL: Sinnl-Ljubić algorithm [14]

Time: total time (in seconds) spent for the reduction, writing an ILP and by the ILP-solver

Instance	$|V|$	$|E|$	$|V'|$	$|E'|$	Opt	POP1 Time[s]	POP1R Time[s]	POP2 Time[s]	POP2R Time[s]	SL Time[s]
B01-10-12	50	63	50	63	341	0.05	0.06	0.06	0.06	0.01
B01-10-3	50	63	50	63	140	0.02	0.02	0.02	0.02	0.00
B01-10-6	50	63	50	63	341	0.03	0.03	0.03	0.03	0.01
B01-10-9	50	63	50	63	341	0.04	0.05	0.05	0.05	0.01
B01-5-12	50	63	50	63	431	0.06	0.06	0.06	0.06	0.02
B01-5-3	50	63	50	63	140	0.02	0.02	0.02	0.02	0.00
B01-5-6	50	63	50	63	403	0.03	0.03	0.03	0.03	0.00
B01-5-9	50	63	50	63	431	0.05	0.05	0.07	0.05	0.01
B02-10-12	50	63	50	63	300	0.08	0.08	0.19	0.12	0.08
B02-10-3	50	63	50	63	182	0.02	0.02	0.02	0.02	0.00
B02-10-6	50	63	50	63	300	0.03	0.03	0.03	0.03	0.01
B02-10-9	50	63	50	63	300	0.05	0.05	0.05	0.06	0.06
B02-5-12	50	63	50	63	600	0.10	0.11	0.09	0.09	0.08
B02-5-3	50	63	50	63	182	0.02	0.02	0.02	0.02	0.00
B02-5-6	50	63	50	63	491	0.04	0.04	0.04	0.04	0.02
B02-5-9	50	63	50	63	600	0.05	0.05	0.07	0.07	0.02
B03-10-12	50	63	50	63	649	0.06	0.06	0.06	0.06	0.01
B03-10-3	50	63	50	63	253	0.02	0.02	0.02	0.02	0.00
B03-10-6	50	63	50	63	624	0.03	0.03	0.03	0.04	0.01
B03-10-9	50	63	50	63	649	0.04	0.05	0.05	0.05	0.01
B03-5-12	50	63	50	63	931	0.10	0.08	0.09	0.09	0.07
B03-5-3	50	63	50	63	253	0.02	0.02	0.02	0.02	0.00
B03-5-6	50	63	50	63	807	0.03	0.03	0.03	0.04	0.01
B03-5-9	50	63	50	63	924	0.06	0.07	0.06	0.07	0.03
B04-10-12	50	100	50	98	455	0.15	0.17	0.12	0.14	0.02
B04-10-3	50	100	50	98	341	0.03	0.03	0.03	0.03	0.00
B04-10-6	50	100	50	98	447	0.17	0.19	0.19	0.20	0.29
B04-10-9	50	100	50	98	455	0.12	0.18	0.14	0.12	0.02
B04-5-12	50	100	50	98	455	0.08	0.08	0.09	0.09	0.01
B04-5-3	50	100	50	98	341	0.03	0.03	0.03	0.03	0.00
B04-5-6	50	100	50	98	455	0.05	0.05	0.06	0.06	0.01
B04-5-9	50	100	50	98	455	0.07	0.07	0.07	0.07	0.01
B05-10-12	50	100	50	95	652	0.08	0.08	0.09	0.09	0.02
B05-10-3	50	100	50	95	565	0.03	0.03	0.03	0.03	0.00
B05-10-6	50	100	50	95	643	0.06	0.05	0.06	0.06	0.03
B05-10-9	50	100	50	95	652	0.07	0.06	0.07	0.07	0.01
B05-5-12	50	100	50	95	666	0.08	0.07	0.09	0.09	0.01
B05-5-3	50	100	50	95	588	0.03	0.03	0.03	0.03	0.00
B05-5-6	50	100	50	95	666	0.05	0.05	0.05	0.05	0.01
B05-5-9	50	100	50	95	666	0.06	0.06	0.07	0.07	0.01
B06-10-12	50	100	50	99	903	0.11	0.11	0.11	0.11	0.02
B06-10-3	50	100	50	99	610	0.04	0.03	0.03	0.03	0.03
B06-10-6	50	100	50	99	839	0.11	0.11	0.15	0.18	0.14
B06-10-9	50	100	50	99	903	0.11	0.11	0.11	0.16	0.10
B06-5-12	50	100	50	99	1262	1.20	1.57	1.16	1.17	0.07
B06-5-3	50	100	50	99	1035	0.03	0.03	0.03	0.03	0.00
B06-5-6	50	100	50	99	1257	0.21	0.21	0.25	0.26	0.36
B06-5-9	50	100	50	99	1262	0.48	0.41	0.48	0.53	0.47
B07-10-12	75	94	75	94	432	0.10	0.10	0.10	0.14	0.06
B07-10-3	75	94	75	94	87	0.03	0.03	0.03	0.03	0.00
B07-10-6	75	94	75	94	432	0.04	0.04	0.04	0.05	0.01
B07-10-9	75	94	75	94	432	0.07	0.08	0.07	0.08	0.04
B07-5-12	75	94	75	94	662	0.09	0.10	0.09	0.09	0.03
B07-5-3	75	94	75	94	87	0.03	0.03	0.03	0.03	0.00
B07-5-6	75	94	75	94	627	0.04	0.04	0.04	0.04	0.00
B07-5-9	75	94	75	94	662	0.07	0.07	0.07	0.07	0.02
B08-10-12	75	94	75	94	537	0.47	0.30	0.33	0.50	0.08
B08-10-3	75	94	75	94	85	0.03	0.03	0.03	0.03	0.00
B08-10-6	75	94	75	94	346	0.04	0.04	0.05	0.05	0.01
B08-10-9	75	94	75	94	537	0.09	0.08	0.10	0.10	0.05
B08-5-12	75	94	75	94	832	0.21	0.20	0.20	0.21	0.02
B08-5-3	75	94	75	94	85	0.03	0.03	0.03	0.03	0.00
B08-5-6	75	94	75	94	535	0.04	0.04	0.04	0.04	0.00
B08-5-9	75	94	75	94	761	0.14	0.15	0.15	0.19	0.46
B09-10-12	75	94	75	94	816	0.24	0.20	0.21	0.20	0.25

Instance	$|V|$	$|E|$	$|V'|$	$|E'|$	Opt	POP1 Time[s]	POP1R Time[s]	POP2 Time[s]	POP2R Time[s]	SL Time[s]
B09-10-12	75	94	75	94	816	0.24	0.20	0.21	0.20	0.25
B09-10-3	75	94	75	94	483	0.03	0.03	0.03	0.03	0.01
B09-10-6	75	94	75	94	816	0.05	0.06	0.06	0.06	0.05
B09-10-9	75	94	75	94	816	0.11	0.10	0.11	0.12	0.22
B09-5-12	75	94	75	94	1388	0.10	0.10	0.12	0.13	0.20
B09-5-3	75	94	75	94	596	0.03	0.03	0.03	0.03	0.00
B09-5-6	75	94	75	94	1343	0.06	0.06	0.06	0.06	0.08
B09-5-9	75	94	75	94	1388	0.09	0.09	0.09	0.11	0.15
B10-10-12	75	150	75	147	694	0.23	0.15	0.23	0.22	0.05
B10-10-3	75	150	75	147	319	0.04	0.04	0.04	0.04	0.00
B10-10-6	75	150	75	147	668	0.28	0.28	0.34	0.23	0.22
B10-10-9	75	150	75	147	694	0.14	0.15	0.24	0.15	0.25
B10-5-12	75	150	75	147	702	0.12	0.13	0.14	0.15	0.01
B10-5-3	75	150	75	147	319	0.04	0.04	0.04	0.04	0.00
B10-5-6	75	150	75	147	702	0.08	0.08	0.08	0.08	0.01
B10-5-9	75	150	75	147	702	0.10	0.10	0.11	0.11	0.01
B11-10-12	75	150	75	150	855	0.59	1.55	0.72	0.68	0.13
B11-10-3	75	150	75	150	305	0.04	0.04	0.04	0.04	0.00
B11-10-6	75	150	75	150	829	0.25	0.29	0.21	0.35	0.31
B11-10-9	75	150	75	150	855	0.29	0.33	0.31	0.31	0.05
B11-5-12	75	150	75	150	893	0.12	0.12	0.14	0.14	0.01
B11-5-3	75	150	75	150	316	0.04	0.04	0.04	0.04	0.00
B11-5-6	75	150	75	150	893	0.08	0.08	0.08	0.08	0.01
B11-5-9	75	150	75	150	893	0.10	0.10	0.11	0.11	0.01
B12-10-12	75	150	75	149	1401	0.19	0.17	0.21	0.19	0.19
B12-10-3	75	150	75	149	1017	0.04	0.05	0.05	0.05	0.03
B12-10-6	75	150	75	149	1384	0.10	0.10	0.10	0.12	0.04
B12-10-9	75	150	75	149	1401	0.16	0.18	0.19	0.21	0.11
B12-5-12	75	150	75	149	1866	0.21	0.23	0.16	0.15	0.04
B12-5-3	75	150	75	149	1169	0.04	0.04	0.05	0.05	0.01
B12-5-6	75	150	75	149	1847	0.74	0.68	1.07	1.11	0.49
B12-5-9	75	150	75	149	1866	0.12	0.27	0.18	0.16	0.22
B13-10-12	100	125	100	125	465	0.31	0.34	0.35	0.35	0.59
B13-10-3	100	125	100	125	147	0.04	0.04	0.04	0.04	0.00
B13-10-6	100	125	100	125	452	0.07	0.07	0.06	0.07	0.03
B13-10-9	100	125	100	125	465	0.23	0.13	0.24	0.23	0.65
B13-5-12	100	125	100	125	745	0.30	0.26	0.29	0.26	0.11
B13-5-3	100	125	100	125	147	0.04	0.04	0.04	0.04	0.00
B13-5-6	100	125	100	125	674	0.08	0.09	0.10	0.10	0.07
B13-5-9	100	125	100	125	745	0.13	0.14	0.15	0.14	0.15
B14-10-12	100	125	100	125	595	0.14	0.13	0.13	0.13	0.07
B14-10-3	100	125	100	125	263	0.04	0.04	0.04	0.04	0.00
B14-10-6	100	125	100	125	595	0.05	0.06	0.06	0.06	0.01
B14-10-9	100	125	100	125	595	0.10	0.10	0.10	0.11	0.03
B14-5-12	100	125	100	125	1038	0.22	0.23	0.22	0.27	0.15
B14-5-3	100	125	100	125	263	0.04	0.04	0.04	0.04	0.00
B14-5-6	100	125	100	125	977	0.06	0.06	0.06	0.06	0.04
B14-5-9	100	125	100	125	1033	0.11	0.11	0.11	0.11	0.16
B15-10-12	100	125	100	125	1109	0.13	0.12	0.12	0.13	0.12
B15-10-3	100	125	100	125	830	0.04	0.04	0.04	0.04	0.01
B15-10-6	100	125	100	125	1040	0.13	0.13	0.16	0.15	0.28
B15-10-9	100	125	100	125	1086	0.12	0.12	0.15	0.14	0.20
B15-5-12	100	125	100	125	1891	0.10	0.12	0.12	0.12	0.04
B15-5-3	100	125	100	125	1061	0.04	0.04	0.04	0.04	0.00
B15-5-6	100	125	100	125	1858	0.07	0.07	0.08	0.08	0.05
B15-5-9	100	125	100	125	1891	0.09	0.09	0.10	0.10	0.02
B16-10-12	100	200	100	198	800	0.17	0.18	0.19	0.19	0.03
B16-10-3	100	200	100	198	479	0.05	0.06	0.05	0.06	0.00
B16-10-6	100	200	100	198	767	0.62	0.65	0.57	0.63	0.84
B16-10-9	100	200	100	198	800	0.16	0.16	0.36	0.20	0.02
B16-5-12	100	200	100	198	840	0.17	0.18	0.19	0.18	0.02
B16-5-3	100	200	100	198	479	0.05	0.06	0.05	0.06	0.00
B16-5-6	100	200	100	198	840	0.11	0.11	0.11	0.12	0.01
B16-5-9	100	200	100	198	840	0.13	0.13	0.14	0.14	0.02
B17-10-12	100	200	100	200	1225	0.20	0.22	0.23	0.28	0.08
B17-10-3	100	200	100	200	254	0.46	0.41	0.07	0.07	0.00
B17-10-6	100	200	100	200	1091	0.10	0.10	0.10	0.10	0.03
B17-10-9	100	200	100	200	1178	0.81	0.55	0.63	0.72	0.70
B17-5-12	100	200	100	200	1299	0.17	0.18	0.18	0.19	0.02
B17-5-3	100	200	100	200	254	0.20	0.16	0.07	0.07	0.00
B17-5-6	100	200	100	200	1299	0.09	0.10	0.09	0.10	0.04
B17-5-9	100	200	100	200	1299	0.14	0.15	0.16	0.15	0.01
B18-10-12	100	200	100	198	1997	1.03	1.46	0.99	0.85	86.54
B18-10-3	100	200	100	198	1132	0.06	0.06	0.06	0.06	0.01
B18-10-6	100	200	100	198	1917	0.13	0.13	0.14	0.15	0.07
B18-10-9	100	200	100	198	1997	0.29	0.38	0.37	0.39	1.22

						POP1	POP1R	POP2	POP2R	SL
Instance	$|V|$	$|E|$	$|V'|$	$|E'|$	Opt	Time[s]	Time[s]	Time[s]	Time[s]	Time[s]
B18-5-12	100	200	100	198	2585	0.18	0.23	0.21	0.22	0.25
B18-5-3	100	200	100	198	1298	0.05	0.06	0.06	0.06	0.00
B18-5-6	100	200	100	198	2575	0.33	0.29	0.28	0.31	0.70
B18-5-9	100	200	100	198	2585	0.19	0.18	0.26	0.26	0.43
C01-100-10-15	500	625	500	625	274	0.66	0.68	0.67	0.68	0.04
C01-100-10-25	500	625	500	625	274	1.09	1.10	1.09	1.11	0.08
C01-100-10-5	500	625	500	625	71	0.25	0.28	0.26	0.28	0.00
C01-100-30-15	500	625	500	625	274	0.68	0.69	0.66	0.70	0.04
C01-100-30-25	500	625	500	625	274	1.11	1.12	1.12	1.18	0.08
C01-100-30-5	500	625	500	625	71	0.27	0.27	0.26	0.28	0.00
C01-10-10-15	500	625	500	625	27	0.65	0.68	0.67	0.67	0.04
C01-10-10-25	500	625	500	625	27	1.08	1.11	1.08	1.11	0.07
C01-10-10-5	500	625	500	625	8	0.26	0.27	0.26	0.28	0.00
C01-10-30-15	500	625	500	625	27	0.67	0.67	0.67	0.69	0.04
C01-10-30-25	500	625	500	625	27	1.10	1.12	1.13	1.13	0.07
C01-10-30-5	500	625	500	625	8	0.26	0.27	0.26	0.27	0.00
C02-100-10-15	500	625	500	625	604	0.68	0.68	0.66	0.71	0.05
C02-100-10-25	500	625	500	625	604	1.14	1.11	1.10	1.11	0.09
C02-100-10-5	500	625	500	625	328	0.25	0.27	0.25	0.27	0.00
C02-100-30-15	500	625	500	625	546	1.63	1.19	1.95	1.52	0.44
C02-100-30-25	500	625	500	625	546	1.59	1.34	1.49	1.56	0.59
C02-100-30-5	500	625	500	625	328	0.25	0.27	0.25	0.28	0.00
C02-10-10-15	500	625	500	625	59	0.66	0.69	0.68	0.70	0.05
C02-10-10-25	500	625	500	625	59	1.10	1.12	1.09	1.14	0.08
C02-10-10-5	500	625	500	625	32	0.25	0.28	0.25	0.28	0.00
C02-10-30-15	500	625	500	625	53	0.75	0.76	2.61	1.18	0.35
C02-10-30-25	500	625	500	625	53	1.50	1.25	1.28	1.31	0.56
C02-10-30-5	500	625	500	625	32	0.25	0.28	0.26	0.27	0.00
C03-100-10-15	500	625	500	625	2971	16.49	19.34	13.26	31.49	26.24
C03-100-10-25	500	625	500	625	2979	24.50	24.16	34.40	30.40	13.06
C03-100-10-5	500	625	500	625	1519	0.25	0.27	0.26	0.27	0.01
C03-100-30-15	500	625	500	625	1343	0.76	0.78	0.80	0.81	0.58
C03-100-30-25	500	625	500	625	1343	1.30	1.32	1.82	1.46	2.42
C03-100-30-5	500	625	500	625	968	0.25	0.27	0.26	0.28	0.06
C03-10-10-15	500	625	500	625	289	13.29	15.00	15.57	11.50	2.87
C03-10-10-25	500	625	500	625	289	21.06	25.39	22.44	41.75	1.97
C03-10-10-5	500	625	500	625	151	0.25	0.27	0.26	0.28	0.01
C03-10-30-15	500	625	500	625	129	0.77	0.79	0.81	1.33	0.47
C03-10-30-25	500	625	500	625	129	1.27	1.29	1.33	1.52	1.21
C03-10-30-5	500	625	500	625	95	0.25	0.28	0.25	0.28	0.02
C04-100-10-15	500	625	500	625	3458	2.62	3.32	3.96	3.84	25.69
C04-100-10-25	500	625	500	625	3504	4.80	4.16	7.16	6.27	4.73
C04-100-10-5	500	625	500	625	1148	0.27	0.30	0.29	0.32	0.00
C04-100-30-15	500	625	500	625	1380	1.31	1.46	2.36	2.71	4.26
C04-100-30-25	500	625	500	625	1396	2.82	3.75	3.12	2.94	4.53
C04-100-30-5	500	625	500	625	854	0.27	0.30	0.29	0.32	0.01
C04-10-10-15	500	625	500	625	336	2.95	2.92	2.45	4.08	10.92
C04-10-10-25	500	625	500	625	341	2.95	5.36	2.65	2.13	2.42
C04-10-10-5	500	625	500	625	115	0.27	0.30	0.29	0.30	0.00
C04-10-30-15	500	625	500	625	134	1.28	2.54	1.41	1.10	3.01
C04-10-30-25	500	625	500	625	136	1.48	2.54	1.60	2.31	2.26
C04-10-30-5	500	625	500	625	84	0.27	0.30	0.29	0.31	0.01
C05-100-10-15	500	625	500	625	5032	7.58	12.31	9.61	9.38	24.13
C05-100-10-25	500	625	500	625	5044	10.93	13.37	25.46	14.21	21.53
C05-100-10-5	500	625	500	625	2600	0.26	0.28	0.27	0.28	0.01
C05-100-30-15	500	625	500	625	1857	2.41	1.93	1.95	1.48	4.31
C05-100-30-25	500	625	500	625	1860	4.25	3.23	3.35	3.54	16.24
C05-100-30-5	500	625	500	625	1584	0.26	0.28	0.27	0.28	0.01
C05-10-10-15	500	625	500	625	494	3.08	7.22	7.66	8.47	15.86
C05-10-10-25	500	625	500	625	495	10.35	11.77	13.38	13.49	13.30
C05-10-10-5	500	625	500	625	258	0.27	0.28	0.27	0.29	0.01
C05-10-30-15	500	625	500	625	182	1.59	2.13	2.40	3.00	9.88
C05-10-30-25	500	625	500	625	183	6.57	2.56	4.39	4.38	5.45
C05-10-30-5	500	625	500	625	154	0.26	0.28	0.26	0.29	0.01
C06-100-20-15	500	1000	500	998	274	1.13	1.18	1.17	1.14	0.09
C06-100-20-25	500	1000	500	998	274	1.79	1.86	1.81	1.89	0.20
C06-100-20-5	500	1000	500	998	274	0.35	0.37	0.35	0.38	0.01
C06-100-50-15	500	1000	500	998	274	1.13	1.21	1.18	1.17	0.09
C06-100-50-25	500	1000	500	998	274	1.87	1.86	1.87	1.89	0.20
C06-100-50-5	500	1000	500	998	274	0.37	0.37	0.35	0.37	0.01
C06-10-20-15	500	1000	500	998	27	1.14	1.16	1.12	1.16	0.09
C06-10-20-25	500	1000	500	998	27	1.84	1.90	1.85	1.88	0.21
C06-10-20-5	500	1000	500	998	27	0.36	0.38	0.37	0.38	0.01
C06-10-50-15	500	1000	500	998	27	1.15	1.22	1.11	1.20	0.09
C06-10-50-25	500	1000	500	998	27	1.86	1.91	1.87	1.85	0.20
C06-10-50-5	500	1000	500	998	27	0.35	0.38	0.36	0.38	0.01

Instance	$|V|$	$|E|$	$|V'|$	$|E'|$	Opt	POP1 Time[s]	POP1R Time[s]	POP2 Time[s]	POP2R Time[s]	SL Time[s]
C07-100-20-15	500	1000	500	1000	604	1.08	1.09	1.09	1.11	0.09
C07-100-20-25	500	1000	500	1000	604	1.68	1.70	1.78	1.73	0.20
C07-100-20-5	500	1000	500	1000	503	0.36	0.39	0.37	0.38	0.01
C07-100-50-15	500	1000	500	1000	604	1.23	1.30	1.19	1.69	0.09
C07-100-50-25	500	1000	500	1000	604	2.06	2.25	2.10	2.11	0.20
C07-100-50-5	500	1000	500	1000	503	0.36	0.39	0.35	0.39	0.01
C07-10-20-15	500	1000	500	1000	59	1.07	1.09	1.09	1.08	0.09
C07-10-20-25	500	1000	500	1000	59	1.70	1.69	1.75	1.79	0.20
C07-10-20-5	500	1000	500	1000	49	0.35	0.38	0.36	0.38	0.01
C07-10-50-15	500	1000	500	1000	59	1.44	1.28	1.16	1.64	0.09
C07-10-50-25	500	1000	500	1000	59	2.01	2.18	2.07	2.32	0.20
C07-10-50-5	500	1000	500	1000	49	0.36	0.39	0.35	0.39	0.01
C08-100-20-15	500	1000	500	1000	3431	18.92	21.61	22.63	21.23	2074.88
C08-100-20-25	500	1000	500	1000	3455	3.03	3.01	2.36	3.00	13.27
C08-100-20-5	500	1000	500	1000	2380	0.36	0.37	0.36	0.39	0.04
C08-100-50-15	500	1000	500	1000	1776	3.26	4.14	4.71	3.44	13.52
C08-100-50-25	500	1000	500	1000	1792	2.88	3.09	2.50	3.24	16.46
C08-100-50-5	500	1000	500	1000	1216	0.36	0.40	0.37	0.39	0.09
C08-10-20-15	500	1000	500	1000	331	7.57	10.18	3.29	12.66	15.15
C08-10-20-25	500	1000	500	1000	332	12.62	9.61	18.02	8.14	2.50
C08-10-20-5	500	1000	500	1000	230	0.36	0.39	0.36	0.38	0.03
C08-10-50-15	500	1000	500	1000	171	6.68	4.89	2.23	8.35	10.18
C08-10-50-25	500	1000	500	1000	172	4.42	5.66	2.99	2.90	3.77
C08-10-50-5	500	1000	500	1000	116	0.38	0.39	0.38	0.39	0.05
C09-100-20-15	500	1000	500	998	3945	12.83	7.51	6.95	3.92	383.44
C09-100-20-25	500	1000	500	998	3974	4.52	9.51	6.94	10.82	17.73
C09-100-20-5	500	1000	500	998	3133	0.46	0.50	0.46	0.47	0.28
C09-100-50-15	500	1000	500	998	1906	3.66	3.96	2.10	7.01	49.19
C09-100-50-25	500	1000	500	998	1933	2.49	2.27	2.71	2.83	8.93
C09-100-50-5	500	1000	500	998	1563	0.42	0.44	0.44	0.45	0.27
C09-10-20-15	500	1000	500	998	381	21.33	18.30	16.04	21.54	2394.84
C09-10-20-25	500	1000	500	998	385	5.07	25.97	23.18	13.61	13.35
C09-10-20-5	500	1000	500	998	304	0.45	0.46	0.47	0.48	0.35
C09-10-50-15	500	1000	500	998	185	5.37	2.57	3.59	2.86	13.54
C09-10-50-25	500	1000	500	998	187	16.91	5.63	5.65	8.90	5.81
C09-10-50-5	500	1000	500	998	149	0.41	0.44	0.43	0.46	0.36
C10-100-20-15	500	1000	500	1000	5906	488.05	426.99	465.16	377.62	10802.4
C10-100-20-25	500	1000	500	1000	5972	394.34	753.28	355.37	209.13	345.96
C10-100-20-5	500	1000	500	1000	4096	0.40	0.40	0.43	0.42	0.08
C10-100-50-15	500	1000	500	1000	2657	21.22	8.64	9.18	13.80	12.81
C10-100-50-25	500	1000	500	1000	2683	35.89	10.75	50.06	39.46	9.45
C10-100-50-5	500	1000	500	1000	1940	0.39	0.42	0.42	0.44	0.31
C10-10-20-15	500	1000	500	1000	573	246.23	402.21	378.04	571.58	10802.8
C10-10-20-25	500	1000	500	1000	580	154.34	130.44	180.34	112.91	132.70
C10-10-20-5	500	1000	500	1000	391	0.39	0.42	0.40	0.44	0.07
C10-10-50-15	500	1000	500	1000	257	8.53	7.46	11.76	8.92	3.77
C10-10-50-25	500	1000	500	1000	258	20.66	24.65	26.03	27.55	5.26
C10-10-50-5	500	1000	500	1000	185	0.39	0.43	0.43	0.42	0.17
C11-100-100-15	500	2500	500	2497	274	2.97	2.90	2.80	3.11	0.19
C11-100-100-25	500	2500	500	2497	274	4.58	4.38	4.72	4.51	0.36
C11-100-100-5	500	2500	500	2497	274	1.17	1.25	1.24	1.30	0.02
C11-100-20-15	500	2500	500	2497	274	2.74	2.88	2.77	2.71	0.19
C11-100-20-25	500	2500	500	2497	274	4.13	4.29	4.24	4.32	0.38
C11-100-20-5	500	2500	500	2497	274	1.17	1.24	1.20	1.26	0.02
C11-10-100-15	500	2500	500	2497	27	3.05	2.95	2.85	3.32	0.19
C11-10-100-25	500	2500	500	2497	27	4.74	4.70	4.50	4.41	0.37
C11-10-100-5	500	2500	500	2497	27	1.19	1.23	1.20	1.25	0.02
C11-10-20-15	500	2500	500	2497	27	2.81	2.86	2.75	2.89	0.19
C11-10-20-25	500	2500	500	2497	27	4.15	4.12	4.20	4.44	0.37
C11-10-20-5	500	2500	500	2497	27	1.17	1.30	1.23	1.25	0.02
C12-100-100-15	500	2500	500	2448	604	3.14	3.12	6.86	5.30	0.19
C12-100-100-25	500	2500	500	2448	604	4.91	4.87	7.65	7.01	0.37
C12-100-100-5	500	2500	500	2448	604	1.21	1.26	1.28	1.41	0.03
C12-100-20-15	500	2500	500	2448	604	3.31	3.09	5.58	4.14	0.19
C12-100-20-25	500	2500	500	2448	604	4.94	5.25	557.48	7.15	0.36
C12-100-20-5	500	2500	500	2448	604	1.22	1.25	1.26	1.28	0.03
C12-10-100-15	500	2500	500	2448	59	3.10	3.12	11.21	21.38	0.19
C12-10-100-25	500	2500	500	2448	59	5.10	4.82	28.05	8.15	0.36
C12-10-100-5	500	2500	500	2448	59	1.18	1.24	1.26	1.38	0.03
C12-10-20-15	500	2500	500	2448	59	3.01	3.10	8.98	8.69	0.19
C12-10-20-25	500	2500	500	2448	59	5.08	4.83	26.44	12.88	0.36
C12-10-20-5	500	2500	500	2448	59	1.16	1.23	1.27	1.32	0.03
C13-100-100-15	500	2500	500	2481	3312	57.04	46.74	42.12	45.93	47.37
C13-100-100-25	500	2500	500	2481	3317	119.19	73.76	173.22	139.50	41.32
C13-100-100-5	500	2500	500	2481	2653	24.01	17.20	18.70	21.48	7.22
C13-100-20-15	500	2500	500	2481	4463	3.95	4.40	5.86	5.55	0.21

Instance	$|V|$	$|E|$	$|V'|$	$|E'|$	Opt	POP1 Time[s]	POP1R Time[s]	POP2 Time[s]	POP2R Time[s]	SL Time[s]
C13-100-20-25	500	2500	500	2481	4463	6.07	6.77	9.64	8.85	0.39
C13-100-20-5	500	2500	500	2481	4463	1.29	1.32	1.23	1.36	0.07
C13-10-100-15	500	2500	500	2481	319	23.46	23.24	27.46	32.05	30.59
C13-10-100-25	500	2500	500	2481	319	36.83	27.29	44.79	79.78	20.09
C13-10-100-5	500	2500	500	2481	257	22.83	24.03	16.56	14.98	4.73
C13-10-20-15	500	2500	500	2481	439	4.14	4.03	5.06	5.75	0.21
C13-10-20-25	500	2500	500	2481	439	6.27	6.16	8.58	10.49	0.38
C13-10-20-5	500	2500	500	2481	439	1.25	1.29	1.35	1.46	0.07
C14-100-100-15	500	2500	500	2286	4205	6.37	6.47	9.73	11.27	0.86
C14-100-100-25	500	2500	500	2286	4205	9.55	9.32	19.10	17.23	3.21
C14-100-100-5	500	2500	500	2286	3887	4.06	4.32	3.71	3.64	3.01
C14-100-20-15	500	2500	500	2286	6566	4.97	4.69	8.35	7.60	0.21
C14-100-20-25	500	2500	500	2286	6566	7.78	6.88	13.38	11.17	0.40
C14-100-20-5	500	2500	500	2286	6566	1.36	1.24	1.41	1.37	0.18
C14-10-100-15	500	2500	500	2286	404	7.11	6.25	12.17	10.55	3.38
C14-10-100-25	500	2500	500	2286	404	9.47	10.94	19.12	18.51	3.13
C14-10-100-5	500	2500	500	2286	373	3.90	3.89	2.92	2.83	3.45
C14-10-20-15	500	2500	500	2286	648	5.42	5.08	10.39	7.67	0.21
C14-10-20-25	500	2500	500	2286	648	7.47	7.03	12.02	11.33	0.40
C14-10-20-5	500	2500	500	2286	648	1.68	1.71	1.70	1.59	0.19
C15-100-100-15	500	2500	500	2432	5889	63.70	50.33	99.13	78.75	57.78
C15-100-100-25	500	2500	500	2432	5905	101.83	68.19	108.50	97.75	10.97
C15-100-100-5	500	2500	500	2432	5000	24.41	20.90	12.88	28.34	1.95
C15-100-20-15	500	2500	500	2432	12533	8.68	7.66	29.36	27.78	0.22
C15-100-20-25	500	2500	500	2432	12533	11.84	13.69	160.82	68.23	0.41
C15-100-20-5	500	2500	500	2432	12533	7.55	47.33	8.24	11.55	24.70
C15-10-100-15	500	2500	500	2432	568	34.82	49.56	124.83	55.37	31.34
C15-10-100-25	500	2500	500	2432	569	71.00	60.74	99.48	70.82	4.94
C15-10-100-5	500	2500	500	2432	480	27.14	26.01	37.26	20.65	2.41
C15-10-20-15	500	2500	500	2432	1248	9.66	9.46	31.76	27.45	0.22
C15-10-20-25	500	2500	500	2432	1248	11.43	15.84	452.41	104.50	0.43
C15-10-20-5	500	2500	500	2432	1248	10.18	12.00	1105.97	19.48	293.74
C16-100-10000-15	500	12500	500	7149	203	24.10	12.34	23.83	12.45	4.92
C16-100-10000-25	500	12500	500	7149	203	32.97	17.02	33.81	16.61	11.20
C16-100-10000-5	500	12500	500	7149	203	14.40	6.52	14.39	6.49	3.26
C16-100-100-15	500	12500	500	7149	274	23.17	10.86	33.58	11.74	0.75
C16-100-100-25	500	12500	500	7149	274	33.12	16.38	37.81	17.68	1.21
C16-100-100-5	500	12500	500	7149	274	12.86	6.06	13.10	5.92	0.45
C16-100-200-15	500	12500	500	7149	274	22.73	10.77	34.31	11.51	0.77
C16-100-200-25	500	12500	500	7149	274	32.65	16.43	37.85	17.87	1.15
C16-100-200-5	500	12500	500	7149	274	12.84	6.07	12.92	6.14	0.43
C16-10-10000-15	500	12500	500	7149	19	24.10	12.04	23.50	12.38	4.97
C16-10-10000-25	500	12500	500	7149	19	33.19	17.06	33.36	16.87	11.19
C16-10-10000-5	500	12500	500	7149	19	14.44	6.44	14.49	6.54	3.20
C16-10-100-15	500	12500	500	7149	27	22.63	11.00	33.59	11.70	0.77
C16-10-100-25	500	12500	500	7149	27	34.52	16.66	37.75	17.99	1.13
C16-10-100-5	500	12500	500	7149	27	12.80	5.92	13.35	6.06	0.43
C16-10-200-15	500	12500	500	7149	27	22.93	10.62	34.85	11.64	0.76
C16-10-200-25	500	12500	500	7149	27	33.50	16.44	37.85	17.69	1.13
C16-10-200-5	500	12500	500	7149	27	12.98	6.05	12.90	5.87	0.43
C17-100-100-15	500	12500	500	7273	604	32.09	12.46	35.64	13.00	0.77
C17-100-100-25	500	12500	500	7273	604	39.57	18.56	43.04	20.50	1.23
C17-100-100-5	500	12500	500	7273	604	13.55	6.15	13.48	6.03	0.47
C17-100-200-15	500	12500	500	7273	604	32.07	12.39	32.75	13.25	0.78
C17-100-200-25	500	12500	500	7273	604	40.23	19.52	45.68	19.59	1.28
C17-100-200-5	500	12500	500	7273	604	13.27	6.19	13.34	6.24	0.45
C17-100-5000-15	500	12500	500	7273	513	108.48	62.94	131.64	57.07	8.69
C17-100-5000-25	500	12500	500	7273	513	182.34	97.32	138.39	90.46	15.86
C17-100-5000-5	500	12500	500	7273	481	63.00	23.66	50.45	40.40	16.38
C17-10-100-15	500	12500	500	7273	59	31.58	12.87	35.44	12.94	0.77
C17-10-100-25	500	12500	500	7273	59	37.45	20.46	44.66	20.28	1.22
C17-10-100-5	500	12500	500	7273	59	13.28	6.17	13.47	6.07	0.45
C17-10-200-15	500	12500	500	7273	59	30.95	12.94	32.56	13.89	0.78
C17-10-200-25	500	12500	500	7273	59	42.38	20.36	43.97	20.65	1.27
C17-10-200-5	500	12500	500	7273	59	13.27	6.21	13.35	6.11	0.44
C17-10-5000-15	500	12500	500	7273	50	63.85	40.18	110.96	54.65	5.81
C17-10-5000-25	500	12500	500	7273	50	95.95	63.09	125.86	72.37	11.50
C17-10-5000-5	500	12500	500	7273	47	25.07	30.73	33.92	20.28	8.50
C18-100-1000-15	500	12500	500	9361	3552	204.86	173.91	194.62	148.11	137.37
C18-100-1000-25	500	12500	500	9361	3557	318.98	196.14	333.42	215.94	72.09
C18-100-1000-5	500	12500	500	9361	3320	7573.69	6946.25	6918.97	9485.60	10802.9
C18-100-100-15	500	12500	500	9361	4463	30.89	23.06	42.91	37.68	0.82
C18-100-100-25	500	12500	500	9361	4463	57.93	32.90	93.94	50.95	1.29
C18-100-100-5	500	12500	500	9361	4463	13.69	9.16	13.77	9.13	0.47
C18-100-200-15	500	12500	500	9361	4463	40.76	34.62	53.59	50.97	0.80
C18-100-200-25	500	12500	500	9361	4463	77.54	43.79	137.68	78.75	1.29

Instance	$|V|$	$|E|$	$|V'|$	$|E'|$	Opt	POP1 Time[s]	POP1R Time[s]	POP2 Time[s]	POP2R Time[s]	SL Time[s]
C18-100-200-5	500	12500	500	9361	4463	14.76	9.08	14.73	9.32	0.48
C18-10-1000-15	500	12500	500	9361	341	139.21	144.30	204.60	136.24	48.23
C18-10-1000-25	500	12500	500	9361	341	297.33	181.92	299.68	189.23	73.22
C18-10-1000-5	500	12500	500	9361	318	4365.51	10805.8	4504.66	5880.54	3563.14
C18-10-100-15	500	12500	500	9361	439	36.27	25.05	44.01	31.39	0.82
C18-10-100-25	500	12500	500	9361	439	53.80	37.15	85.24	50.37	1.30
C18-10-100-5	500	12500	500	9361	439	14.61	9.85	15.37	10.33	0.47
C18-10-200-15	500	12500	500	9361	439	45.64	32.55	54.66	46.12	0.79
C18-10-200-25	500	12500	500	9361	439	80.00	49.66	124.57	81.46	1.28
C18-10-200-5	500	12500	500	9361	439	15.28	10.55	15.68	10.12	0.47
C19-100-1000-15	500	12500	500	6786	4435	55.29	44.73	109.41	99.04	31.53
C19-100-1000-25	500	12500	500	6786	4435	72.19	58.90	269.15	172.28	69.94
C19-100-1000-5	500	12500	500	6786	4179	1349.36	1192.48	420.19	1027.63	69.58
C19-100-100-15	500	12500	500	6786	6566	35.13	16.29	70.66	26.28	0.78
C19-100-100-25	500	12500	500	6786	6566	54.55	22.66	139.64	37.54	1.17
C19-100-100-5	500	12500	500	6786	6566	13.69	5.99	13.87	5.63	0.47
C19-100-200-15	500	12500	500	6786	6566	34.20	16.51	72.83	39.14	0.80
C19-100-200-25	500	12500	500	6786	6566	52.04	24.01	160.53	60.49	1.17
C19-100-200-5	500	12500	500	6786	6566	14.17	6.21	14.22	6.56	0.48
C19-10-1000-15	500	12500	500	6786	428	34.78	31.95	138.45	95.74	8.06
C19-10-1000-25	500	12500	500	6786	428	66.47	33.50	339.52	100.79	61.72
C19-10-1000-5	500	12500	500	6786	404	852.84	481.46	298.67	338.61	35.90
C19-10-100-15	500	12500	500	6786	648	38.98	18.71	61.13	25.31	0.81
C19-10-100-25	500	12500	500	6786	648	50.13	23.38	164.11	37.74	1.17
C19-10-100-5	500	12500	500	6786	648	14.23	6.70	15.34	6.57	0.47
C19-10-200-15	500	12500	500	6786	648	37.71	20.81	67.79	37.74	0.78
C19-10-200-25	500	12500	500	6786	648	52.51	24.68	198.50	52.33	1.21
C19-10-200-5	500	12500	500	6786	648	14.97	6.97	17.64	7.19	0.46
C20-100-1000-15	500	12500	500	8053	5222	1283.21	996.73	764.14	684.10	10802.8
C20-100-1000-25	500	12500	500	8053	5256	376.35	243.25	1289.25	619.83	48.01
C20-100-1000-5	500	12500	500	8053	4768	10808.9	10804.8	6296.97	5416.53	1327.88
C20-100-100-15	500	12500	500	8053	12533	49.16	29.20	88.55	77.72	0.90
C20-100-100-25	500	12500	500	8053	12533	99.53	46.87	275.11	123.72	1.20
C20-100-100-5	500	12500	500	8053	12533	14.58	7.98	18.60	8.41	0.51
C20-100-200-15	500	12500	500	8053	12533	61.18	42.05	229.92	122.00	0.92
C20-100-200-25	500	12500	500	8053	12533	111.37	70.03	474.35	376.46	1.22
C20-100-200-5	500	12500	500	8053	12533	19.31	9.72	28.42	35.56	0.47
C20-10-1000-15	500	12500	500	8053	504	908.26	604.12	899.85	691.19	874.59
C20-10-1000-25	500	12500	500	8053	506	442.98	442.44	1093.70	647.66	24.10
C20-10-1000-5	500	12500	500	8053	460	10808.8	10804.9	5474.19	5802.33	667.17
C20-10-100-15	500	12500	500	8053	1248	55.67	26.70	108.25	66.27	0.91
C20-10-100-25	500	12500	500	8053	1248	71.99	42.08	478.73	143.56	1.30
C20-10-100-5	500	12500	500	8053	1248	15.99	9.70	18.93	11.83	0.49
C20-10-200-15	500	12500	500	8053	1248	71.37	33.58	214.70	138.21	0.86
C20-10-200-25	500	12500	500	8053	1248	151.40	48.48	451.04	246.71	1.27
C20-10-200-5	500	12500	500	8053	1248	22.27	11.23	53.42	30.98	0.47
average	352	3358	352	2309	1352	109.8	117.5	98.3	90.9	137.6