

4x4 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j4-per10-1	Inst. 01	1002.00	1019	1019.00	1021.0	1022.1	1044.0	4.441	0.20%	0.30%	2.45%	0.44%	0.08	0.10	0.11	0.007
	Inst. 02	1002.00	1019	1019.00	1028.0	1028.3	1035.5	1.369	0.88%	0.91%	1.62%	0.13%	0.08	0.10	0.11	0.006
	Inst. 03	1001.50	1019	1019.00	1024.3	1024.6	1030.0	1.459	0.52%	0.55%	1.08%	0.14%	0.08	0.10	0.11	0.007
	Inst. 04	1009.75	1019	1019.00	1025.3	1025.3	1025.3	0.000	0.61%	0.61%	0.61%	0.00%	0.08	0.10	0.11	0.006
	Inst. 05	1004.75	1019	1019.00	1023.8	1024.8	1031.3	2.593	0.47%	0.56%	1.20%	0.25%	0.09	0.10	0.10	0.005
	Inst. 06	1019.50	1019	1019.50	1034.8	1034.8	1034.8	0.000	1.50%	1.50%	1.50%	0.00%	0.09	0.10	0.10	0.005
	Inst. 07	1006.50	1019	1019.00	1025.8	1025.8	1025.8	0.000	0.66%	0.66%	0.66%	0.00%	0.09	0.10	0.11	0.006
	Inst. 08	1002.75	1019	1019.00	1028.3	1029.3	1036.0	2.680	0.91%	1.01%	1.67%	0.26%	0.08	0.10	0.10	0.006
	Inst. 09	1006.00	1019	1019.00	1027.8	1028.1	1037.8	1.826	0.86%	0.89%	1.84%	0.18%	0.08	0.09	0.11	0.007
	Inst. 10	1008.00	1019	1019.00	1033.3	1033.5	1040.5	1.324	1.40%	1.42%	2.11%	0.13%	0.09	0.10	0.11	0.006
	Crisp	1000	1019	1019.00	1019.0	1020.8	1044.0	5.331	0.00%	0.18%	2.45%	0.52%	0.08	0.09	0.11	0.007
Average				1027.2	1027.6	1034.1	1.569	0.80%	0.84%	1.47%	0.15%	0.08	0.10	0.11	0.006	
j4-per10-2	Inst. 01	1002.25	1000	1002.25	1002.3	1005.4	1049.3	11.924	0.00%	0.31%	4.69%	1.19%	0.09	0.10	0.10	0.005
	Inst. 02	1000.00	1000	1000.00	1000.0	1002.5	1048.0	9.822	0.00%	0.25%	4.80%	0.98%	0.09	0.09	0.11	0.006
	Inst. 03	1000.00	1000	1000.00	1000.0	1001.7	1026.0	6.596	0.00%	0.17%	2.60%	0.66%	0.09	0.10	0.11	0.006
	Inst. 04	1009.50	1000	1009.50	1010.0	1013.6	1050.0	11.155	0.05%	0.41%	4.01%	1.11%	0.09	0.10	0.12	0.007
	Inst. 05	1004.25	1000	1004.25	1007.3	1009.2	1036.8	7.484	0.30%	0.49%	3.24%	0.75%	0.08	0.09	0.11	0.006
	Inst. 06	1018.50	1000	1018.50	1019.3	1019.3	1019.3	0.000	0.07%	0.07%	0.07%	0.00%	0.08	0.09	0.10	0.006
	Inst. 07	1000.75	1000	1000.75	1005.8	1005.8	1005.8	0.000	0.50%	0.50%	0.50%	0.00%	0.09	0.10	0.10	0.005
	Inst. 08	1000.00	1000	1000.00	1000.5	1003.4	1062.0	12.006	0.05%	0.34%	6.20%	1.20%	0.08	0.09	0.11	0.006
	Inst. 09	1000.00	1000	1000.00	1003.3	1003.3	1003.3	0.000	0.33%	0.33%	0.33%	0.00%	0.08	0.09	0.11	0.008
	Inst. 10	1010.00	1000	1010.00	1010.0	1012.9	1049.0	9.176	0.00%	0.29%	3.86%	0.91%	0.09	0.10	0.11	0.006
	Crisp	1000	1000	1000.00	1000.0	1004.2	1049.0	11.584	0.00%	0.42%	4.90%	1.16%	0.09	0.09	0.11	0.006
Average				1005.8	1007.7	1034.9	6.816	0.13%	0.32%	3.03%	0.68%	0.09	0.09	0.11	0.006	
j4-per20-0	Inst. 01	1000.00	1000	1000.00	1006.3	1007.5	1019.8	3.571	0.63%	0.75%	1.98%	0.36%	0.09	0.10	0.11	0.006
	Inst. 02	1000.00	1000	1000.00	1001.0	1001.0	1001.0	0.000	0.10%	0.10%	0.10%	0.00%	0.08	0.10	0.11	0.006
	Inst. 03	1000.00	1000	1000.00	1004.8	1004.9	1007.8	0.552	0.48%	0.49%	0.78%	0.06%	0.09	0.10	0.11	0.006
	Inst. 04	1002.50	1000	1002.50	1003.5	1003.6	1006.0	0.456	0.10%	0.11%	0.35%	0.05%	0.09	0.10	0.11	0.006
	Inst. 05	1006.00	1000	1006.00	1014.8	1015.7	1025.0	2.679	0.87%	0.97%	1.89%	0.27%	0.09	0.10	0.11	0.006
	Inst. 06	1000.25	1000	1000.25	1010.5	1011.6	1024.5	2.862	1.02%	1.14%	2.42%	0.29%	0.09	0.10	0.11	0.007
	Inst. 07	1004.75	1000	1004.75	1007.8	1008.5	1028.8	3.839	0.30%	0.38%	2.39%	0.38%	0.08	0.10	0.11	0.007
	Inst. 08	1000.00	1000	1000.00	1007.8	1007.9	1011.8	0.730	0.78%	0.79%	1.18%	0.07%	0.09	0.10	0.10	0.005
	Inst. 09	1000.00	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	0.09	0.10	0.11	0.007
	Inst. 10	1000.00	1000	1000.00	1003.8	1003.8	1003.8	0.000	0.38%	0.38%	0.38%	0.00%	0.09	0.10	0.11	0.006
	Crisp	1000	1000	1000.00	1000.0	1000.3	1004.0	1.015	0.00%	0.03%	0.40%	0.10%	0.09	0.10	0.11	0.006
Average				1006.0	1006.4	1012.8	1.469	0.46%	0.51%	1.15%	0.15%	0.09	0.10	0.11	0.006	
j4-per20-1	Inst. 01	1001.50	1004	1004.00	1014.8	1014.8	1014.8	0.000	1.07%	1.07%	1.07%	0.00%	0.08	0.10	0.10	0.006
	Inst. 02	1003.75	1004	1004.00	1005.8	1006.7	1013.0	2.507	0.17%	0.27%	0.90%	0.25%	0.08	0.10	0.11	0.006
	Inst. 03	1002.50	1004	1004.00	1006.0	1008.5	1019.3	4.951	0.20%	0.45%	1.52%	0.49%	0.08	0.10	0.13	0.012
	Inst. 04	1007.75	1004	1007.75	1009.8	1011.4	1016.5	2.869	0.20%	0.37%	0.87%	0.28%	0.09	0.10	0.11	0.007
	Inst. 05	1003.00	1004	1004.00	1006.3	1006.9	1014.5	2.118	0.22%	0.29%	1.05%	0.21%	0.09	0.10	0.11	0.007
	Inst. 06	1003.25	1004	1004.00	1013.5	1015.4	1024.8	4.264	0.95%	1.13%	2.07%	0.42%	0.09	0.10	0.11	0.006
	Inst. 07	1011.25	1004	1011.25	1016.0	1016.7	1019.0	1.291	0.47%	0.54%	0.77%	0.13%	0.09	0.10	0.11	0.006
	Inst. 08	1007.00	1004	1007.00	1011.3	1011.7	1013.8	0.948	0.42%	0.46%	0.67%	0.09%	0.08	0.10	0.11	0.006
	Inst. 09	1008.75	1004	1008.75	1015.8	1016.1	1019.0	0.862	0.69%	0.72%	1.02%	0.09%	0.09	0.10	0.11	0.006
	Inst. 10	1009.00	1004	1009.00	1016.3	1016.5	1017.5	0.510	0.72%	0.75%	0.84%	0.05%	0.08	0.10	0.11	0.007
	Crisp	1000	1004	1004.00	1004.0	1005.2	1013.0	3.112	0.00%	0.12%	0.90%	0.31%	0.08	0.10	0.11	0.008
Average				1011.5	1012.5	1017.2	2.032	0.51%	0.61%	1.08%	0.20%	0.09	0.10	0.11	0.007	

4x4 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j4-per20-2	Inst. 01	1002.75	1009	1009.00	1014.0	1014.0	1014.0	0.000	0.50%	0.50%	0.50%	0.00%	0.08	0.10	0.11	0.007
	Inst. 02	1008.50	1009	1009.00	1022.3	1022.4	1023.3	0.305	1.31%	1.32%	1.41%	0.03%	0.08	0.09	0.11	0.007
	Inst. 03	1003.25	1009	1009.00	1017.0	1017.0	1017.0	0.000	0.79%	0.79%	0.79%	0.00%	0.09	0.10	0.10	0.005
	Inst. 04	1008.25	1009	1009.00	1013.8	1014.2	1016.3	0.948	0.47%	0.51%	0.72%	0.09%	0.09	0.10	0.11	0.006
	Inst. 05	1004.25	1009	1009.00	1018.8	1018.8	1018.8	0.000	0.97%	0.97%	0.97%	0.00%	0.09	0.10	0.11	0.006
	Inst. 06	1004.00	1009	1009.00	1019.5	1019.5	1019.5	0.000	1.04%	1.04%	1.04%	0.00%	0.09	0.10	0.10	0.005
	Inst. 07	1001.25	1009	1009.00	1018.5	1018.5	1018.5	0.000	0.94%	0.94%	0.94%	0.00%	0.08	0.10	0.11	0.007
	Inst. 08	1001.25	1009	1009.00	1014.3	1014.3	1014.3	0.000	0.52%	0.52%	0.52%	0.00%	0.09	0.10	0.11	0.007
	Inst. 09	1011.50	1009	1011.50	1017.8	1017.8	1017.8	0.000	0.62%	0.62%	0.62%	0.00%	0.09	0.10	0.10	0.005
	Inst. 10	1017.75	1009	1017.75	1024.5	1024.5	1024.5	0.000	0.66%	0.66%	0.66%	0.00%	0.08	0.10	0.10	0.006
	Crisp	1000	1009	1009.00	1009.0	1009.0	1009.0	0.000	0.00%	0.00%	0.00%	0.00%	0.09	0.10	0.11	0.007
Average					1018.0	1018.1	1018.4	0.125	0.78%	0.79%	0.82%	0.01%	0.09	0.10	0.11	0.006

5x5 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j5-per20-2	Inst. 01	1002.00	1012	1012.00	1016.0	1016.0	1016.0	0.000	0.40%	0.40%	0.40%	0.00%	1.28	1.30	1.38	0.017
	Inst. 02	1000.00	1012	1012.00	1024.0	1024.0	1024.0	0.000	1.19%	1.19%	1.19%	0.00%	1.28	1.29	1.30	0.006
	Inst. 03	1003.50	1012	1012.00	1031.0	1031.0	1031.0	0.000	1.88%	1.88%	1.88%	0.00%	1.28	1.30	1.31	0.007
	Inst. 04	1009.25	1012	1012.00	1024.0	1024.0	1024.0	0.000	1.19%	1.19%	1.19%	0.00%	1.28	1.29	1.30	0.007
	Inst. 05	1001.00	1012	1012.00	1018.5	1018.5	1018.5	0.000	0.64%	0.64%	0.64%	0.00%	1.27	1.29	1.30	0.007
	Inst. 06	1016.50	1012	1016.50	1028.3	1028.3	1028.3	0.000	1.16%	1.16%	1.16%	0.00%	1.28	1.29	1.30	0.007
	Inst. 07	1006.00	1012	1012.00	1024.3	1024.3	1024.3	0.000	1.21%	1.21%	1.21%	0.00%	1.28	1.29	1.31	0.007
	Inst. 08	1000.00	1012	1012.00	1022.0	1022.0	1022.0	0.000	0.99%	0.99%	0.99%	0.00%	1.27	1.29	1.30	0.007
	Inst. 09	1000.25	1012	1012.00	1020.3	1020.3	1020.3	0.000	0.82%	0.82%	0.82%	0.00%	1.28	1.30	1.31	0.007
	Inst. 10	1006.75	1012	1012.00	1020.0	1020.0	1020.0	0.000	0.79%	0.79%	0.79%	0.00%	1.28	1.29	1.30	0.005
	Crisp	1000	1012	1012.00	1012.0	1012.0	1012.0	0.000	0.00%	0.00%	0.00%	0.00%	1.28	1.30	1.31	0.008
	Average				1022.8	1022.8	1022.8	0.000	1.02%	1.02%	1.02%	0.00%	1.28	1.29	1.31	0.008

6x6 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j6-per0-0	Inst. 01	1017.75	1056	1056.00	1066.3	1068.7	1076.0	2.793	0.97%	1.20%	1.89%	0.26%	4.39	4.40	4.41	0.008
	Inst. 02	1023.75	1056	1056.00	1066.5	1068.1	1072.3	1.619	0.99%	1.14%	1.54%	0.15%	4.38	4.40	4.42	0.010
	Inst. 03	1013.75	1056	1056.00	1061.3	1065.1	1069.5	2.950	0.50%	0.86%	1.28%	0.28%	4.39	4.41	4.42	0.009
	Inst. 04	1011.00	1056	1056.00	1063.8	1065.4	1066.8	1.104	0.73%	0.89%	1.02%	0.10%	4.40	4.41	4.43	0.009
	Inst. 05	1012.50	1056	1056.00	1061.5	1063.0	1067.3	1.602	0.52%	0.66%	1.07%	0.15%	4.37	4.40	4.45	0.015
	Inst. 06	1020.00	1056	1056.00	1062.5	1067.8	1074.0	4.487	0.62%	1.12%	1.70%	0.42%	4.39	4.40	4.41	0.008
	Inst. 07	1014.75	1056	1056.00	1061.5	1065.1	1074.3	3.649	0.52%	0.86%	1.73%	0.35%	4.38	4.40	4.44	0.010
	Inst. 08	1013.75	1056	1056.00	1061.3	1065.3	1071.0	3.370	0.50%	0.88%	1.42%	0.32%	4.39	4.41	4.42	0.009
	Inst. 09	1011.50	1056	1056.00	1060.3	1065.8	1073.0	4.429	0.40%	0.93%	1.61%	0.42%	4.38	4.40	4.41	0.009
	Inst. 10	1023.25	1056	1056.00	1064.5	1069.0	1073.0	2.435	0.80%	1.23%	1.61%	0.23%	4.40	4.41	4.43	0.007
	Crisp	1000	1056	1056.00	1056.0	1058.7	1062.0	2.309	0.00%	0.25%	0.57%	0.22%	4.39	4.40	4.46	0.013
Average				1062.9	1066.3	1071.7	2.844	0.66%	0.98%	1.49%	0.27%	4.39	4.41	4.42	0.009	
j6-per0-1	Inst. 01	1022.25	1045	1045.00	1055.3	1064.9	1066.0	3.280	0.98%	1.91%	2.01%	0.31%	4.41	4.42	4.44	0.008
	Inst. 02	1027.00	1045	1045.00	1062.5	1070.2	1071.0	2.594	1.67%	2.41%	2.49%	0.25%	4.41	4.42	4.43	0.008
	Inst. 03	1029.75	1045	1045.00	1076.8	1076.8	1076.8	0.000	3.04%	3.04%	3.04%	0.00%	4.41	4.43	4.45	0.010
	Inst. 04	1017.00	1045	1045.00	1057.3	1064.0	1064.5	1.839	1.17%	1.82%	1.87%	0.18%	4.41	4.42	4.44	0.008
	Inst. 05	1020.00	1045	1045.00	1057.0	1063.3	1066.0	4.195	1.15%	1.75%	2.01%	0.40%	4.41	4.42	4.44	0.008
	Inst. 06	1018.75	1045	1045.00	1064.8	1070.6	1072.8	3.598	1.89%	2.45%	2.66%	0.34%	4.41	4.43	4.44	0.007
	Inst. 07	1017.25	1045	1045.00	1060.5	1070.0	1071.5	3.803	1.48%	2.40%	2.54%	0.36%	4.42	4.43	4.50	0.018
	Inst. 08	1017.50	1045	1045.00	1057.3	1061.7	1063.0	2.474	1.17%	1.59%	1.72%	0.24%	4.41	4.42	4.46	0.012
	Inst. 09	1011.75	1045	1045.00	1052.8	1063.5	1064.3	2.918	0.74%	1.77%	1.84%	0.28%	4.41	4.42	4.44	0.008
	Inst. 10	1022.50	1045	1045.00	1058.3	1065.5	1067.3	3.662	1.27%	1.96%	2.13%	0.35%	4.21	4.26	4.44	0.083
	Crisp	1000	1045	1045.00	1045.0	1055.3	1056.0	2.791	0.00%	0.98%	1.05%	0.27%	4.19	4.22	4.36	0.028
Average				1060.2	1067.0	1068.3	2.836	1.46%	2.11%	2.23%	0.27%	4.39	4.41	4.45	0.017	
j6-per0-2	Inst. 01	1020.00	1063	1063.00	1077.5	1077.6	1080.5	0.548	1.36%	1.37%	1.65%	0.05%	4.20	4.23	4.32	0.025
	Inst. 02	1019.25	1063	1063.00	1078.8	1078.8	1078.8	0.000	1.48%	1.48%	1.48%	0.00%	4.21	4.31	4.46	0.091
	Inst. 03	1024.75	1063	1063.00	1083.3	1083.3	1083.3	0.000	1.90%	1.90%	1.90%	0.00%	4.21	4.27	4.43	0.079
	Inst. 04	1009.50	1063	1063.00	1069.0	1069.0	1069.0	0.000	0.56%	0.56%	0.56%	0.00%	4.19	4.21	4.24	0.011
	Inst. 05	1018.50	1063	1063.00	1075.8	1075.8	1075.8	0.000	1.20%	1.20%	1.20%	0.00%	4.19	4.21	4.42	0.040
	Inst. 06	1017.00	1063	1063.00	1078.3	1078.3	1079.3	0.183	1.43%	1.44%	1.53%	0.02%	4.43	4.44	4.52	0.016
	Inst. 07	1015.25	1063	1063.00	1079.0	1079.0	1079.0	0.000	1.51%	1.51%	1.51%	0.00%	4.20	4.36	4.44	0.095
	Inst. 08	1019.25	1063	1063.00	1074.3	1074.3	1074.3	0.000	1.06%	1.06%	1.06%	0.00%	4.22	4.36	4.49	0.105
	Inst. 09	1012.75	1063	1063.00	1075.8	1075.8	1075.8	0.000	1.20%	1.20%	1.20%	0.00%	4.20	4.27	4.44	0.078
	Inst. 10	1024.00	1063	1063.00	1075.5	1075.5	1075.5	0.000	1.18%	1.18%	1.18%	0.00%	4.21	4.34	4.44	0.099
	Crisp	1000	1063	1063.00	1067.0	1067.0	1067.0	0.000	0.38%	0.38%	0.38%	0.00%	4.21	4.29	4.44	0.072
Average				1076.7	1076.7	1077.1	0.073	1.29%	1.29%	1.33%	0.01%	4.23	4.30	4.42	0.064	
j6-per10-0	Inst. 01	1005.75	1005	1005.75	1018.5	1019.7	1031.0	3.296	1.27%	1.38%	2.51%	0.33%	4.20	4.24	4.30	0.033
	Inst. 02	1001.50	1005	1005.00	1023.0	1025.6	1026.5	1.574	1.79%	2.05%	2.14%	0.16%	4.19	4.24	4.31	0.041
	Inst. 03	1005.00	1005	1005.00	1025.5	1030.5	1031.3	1.386	2.04%	2.54%	2.61%	0.14%	4.25	4.27	4.30	0.012
	Inst. 04	1000.00	1005	1005.00	1014.8	1014.8	1014.8	0.000	0.97%	0.97%	0.97%	0.00%	4.21	4.23	4.28	0.020
	Inst. 05	1000.00	1005	1005.00	1018.8	1020.4	1024.5	2.580	1.37%	1.53%	1.94%	0.26%	4.21	4.25	4.29	0.026
	Inst. 06	1005.50	1005	1005.50	1016.0	1017.2	1026.3	3.076	1.04%	1.16%	2.06%	0.31%	4.21	4.23	4.30	0.028
	Inst. 07	1002.50	1005	1005.00	1015.0	1015.0	1015.0	0.000	1.00%	1.00%	1.00%	0.00%	4.20	4.26	4.30	0.029
	Inst. 08	1000.00	1005	1005.00	1023.5	1024.9	1027.0	1.492	1.84%	1.98%	2.19%	0.15%	4.20	4.22	4.25	0.012
	Inst. 09	1000.00	1005	1005.00	1010.3	1010.7	1023.3	2.373	0.52%	0.57%	1.82%	0.24%	4.21	4.25	4.31	0.023
	Inst. 10	1007.00	1005	1007.00	1028.0	1030.0	1031.0	0.953	2.09%	2.28%	2.38%	0.09%	4.20	4.23	4.29	0.026
	Crisp	1000	1005	1005.00	1005.0	1005.0	1005.0	0.000	0.00%	0.00%	0.00%	0.00%	4.22	4.24	4.32	0.024
Average				1019.3	1020.9	1025.1	1.673	1.39%	1.55%	1.96%	0.17%	4.21	4.24	4.29	0.025	

6x6 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j6-per10-1	Inst. 01	1013.75	1021	1021.00	1034.8	1034.8	1034.8	0.000	1.35%	1.35%	1.35%	0.00%	4.20	4.23	4.30	0.030
	Inst. 02	1008.00	1021	1021.00	1029.8	1029.8	1029.8	0.000	0.86%	0.86%	0.86%	0.00%	4.20	4.23	4.31	0.036
	Inst. 03	1018.75	1021	1021.00	1034.0	1034.0	1034.0	0.000	1.27%	1.27%	1.27%	0.00%	4.21	4.27	4.32	0.036
	Inst. 04	1011.50	1021	1021.00	1029.5	1029.5	1029.5	0.000	0.83%	0.83%	0.83%	0.00%	4.22	4.26	4.34	0.034
	Inst. 05	1005.75	1021	1021.00	1030.3	1030.3	1030.3	0.000	0.91%	0.91%	0.91%	0.00%	4.21	4.26	4.32	0.041
	Inst. 06	1008.75	1021	1021.00	1026.0	1026.0	1026.0	0.000	0.49%	0.49%	0.49%	0.00%	4.21	4.23	4.31	0.027
	Inst. 07	1007.00	1021	1021.00	1025.3	1025.7	1037.3	2.191	0.42%	0.46%	1.59%	0.21%	4.20	4.24	4.31	0.033
	Inst. 08	1004.00	1021	1021.00	1031.8	1032.1	1040.8	1.643	1.05%	1.08%	1.93%	0.16%	4.20	4.21	4.28	0.014
	Inst. 09	1006.00	1021	1021.00	1029.8	1029.8	1029.8	0.000	0.86%	0.86%	0.86%	0.00%	4.21	4.27	4.35	0.041
	Inst. 10	1014.25	1021	1021.00	1028.3	1028.3	1028.3	0.000	0.71%	0.71%	0.71%	0.00%	4.19	4.21	4.28	0.015
	Crisp	1000	1021	1021.00	1021.0	1021.0	1021.0	0.000	0.00%	0.00%	0.00%	0.00%	4.20	4.23	4.31	0.034
Average				1029.9	1030.0	1032.0	0.383	0.87%	0.88%	1.08%	0.04%	4.21	4.24	4.31	0.031	
j6-per10-2	Inst. 01	1001.25	1012	1012.00	1014.8	1014.8	1014.8	0.000	0.27%	0.27%	0.27%	0.00%	4.19	4.23	4.28	0.029
	Inst. 02	1006.25	1012	1012.00	1017.3	1017.3	1017.3	0.000	0.52%	0.52%	0.52%	0.00%	4.19	4.21	4.22	0.007
	Inst. 03	1000.00	1012	1012.00	1018.8	1018.8	1018.8	0.000	0.67%	0.67%	0.67%	0.00%	4.19	4.21	4.29	0.021
	Inst. 04	1003.25	1012	1012.00	1013.8	1013.8	1013.8	0.000	0.17%	0.17%	0.17%	0.00%	4.20	4.22	4.25	0.010
	Inst. 05	1006.00	1012	1012.00	1019.8	1019.8	1019.8	0.000	0.77%	0.77%	0.77%	0.00%	4.19	4.23	4.32	0.033
	Inst. 06	1000.00	1012	1012.00	1017.5	1017.5	1017.5	0.000	0.54%	0.54%	0.54%	0.00%	4.19	4.22	4.32	0.024
	Inst. 07	1011.00	1012	1012.00	1025.8	1025.8	1025.8	0.000	1.36%	1.36%	1.36%	0.00%	4.18	4.21	4.27	0.018
	Inst. 08	1000.00	1012	1012.00	1013.3	1013.3	1013.3	0.000	0.12%	0.12%	0.12%	0.00%	4.19	4.21	4.24	0.013
	Inst. 09	1003.25	1012	1012.00	1018.3	1018.3	1018.3	0.000	0.62%	0.62%	0.62%	0.00%	4.18	4.22	4.32	0.035
	Inst. 10	1009.25	1012	1012.00	1019.3	1019.3	1019.3	0.000	0.72%	0.72%	0.72%	0.00%	4.20	4.24	4.29	0.028
	Crisp	1000	1012	1012.00	1012.0	1012.0	1012.0	0.000	0.00%	0.00%	0.00%	0.00%	4.20	4.21	4.24	0.009
Average				1017.8	1017.8	1017.8	0.000	0.58%	0.58%	0.58%	0.00%	4.19	4.22	4.28	0.022	
j6-per20-0	Inst. 01	1000.00	1000	1000.00	1015.5	1016.0	1016.5	0.507	1.55%	1.60%	1.65%	0.05%	4.19	4.21	4.22	0.009
	Inst. 02	1002.25	1000	1002.25	1013.3	1017.9	1019.8	2.601	1.10%	1.56%	1.75%	0.26%	4.19	4.22	4.23	0.010
	Inst. 03	1000.00	1000	1000.00	1013.0	1013.2	1017.5	0.822	1.30%	1.32%	1.75%	0.08%	4.20	4.22	4.24	0.010
	Inst. 04	1000.00	1000	1000.00	1011.3	1011.3	1011.3	0.000	1.13%	1.13%	1.13%	0.00%	4.19	4.22	4.24	0.014
	Inst. 05	1008.75	1000	1008.75	1017.8	1018.8	1020.0	1.142	0.89%	1.00%	1.12%	0.11%	4.20	4.21	4.24	0.010
	Inst. 06	1000.00	1000	1000.00	1014.3	1014.3	1014.3	0.000	1.43%	1.43%	1.43%	0.00%	4.20	4.23	4.31	0.033
	Inst. 07	1012.00	1000	1012.00	1018.5	1018.5	1018.5	0.000	0.64%	0.64%	0.64%	0.00%	4.19	4.20	4.22	0.008
	Inst. 08	1001.75	1000	1001.75	1013.3	1013.4	1017.5	0.776	1.15%	1.16%	1.57%	0.08%	4.19	4.21	4.23	0.011
	Inst. 09	1002.75	1000	1002.75	1016.8	1017.8	1018.3	0.699	1.40%	1.50%	1.55%	0.07%	4.20	4.21	4.24	0.011
	Inst. 10	1010.25	1000	1010.25	1016.8	1016.8	1019.3	0.456	0.64%	0.65%	0.89%	0.05%	4.19	4.21	4.22	0.010
	Crisp	1000	1000	1000.00	1009.0	1009.4	1010.0	0.490	0.90%	0.94%	1.00%	0.05%	4.20	4.21	4.23	0.008
Average				1015.0	1015.8	1017.3	0.700	1.12%	1.20%	1.35%	0.07%	4.19	4.21	4.24	0.013	
j6-per20-1	Inst. 01	1009.75	1000	1009.75	1009.8	1009.8	1009.8	0.000	0.00%	0.00%	0.00%	0.00%	3.83	3.85	3.86	0.008
	Inst. 02	1004.00	1000	1004.00	1007.8	1007.8	1007.8	0.000	0.37%	0.37%	0.37%	0.00%	3.84	3.86	3.87	0.008
	Inst. 03	1001.75	1000	1001.75	1006.8	1006.8	1006.8	0.000	0.50%	0.50%	0.50%	0.00%	3.85	3.87	3.89	0.008
	Inst. 04	1005.75	1000	1005.75	1005.8	1005.8	1005.8	0.000	0.00%	0.00%	0.00%	0.00%	3.85	3.87	3.89	0.011
	Inst. 05	1005.00	1000	1005.00	1008.8	1008.8	1008.8	0.000	0.37%	0.37%	0.37%	0.00%	3.84	3.86	3.87	0.008
	Inst. 06	1007.75	1000	1007.75	1008.8	1008.8	1009.0	0.123	0.10%	0.11%	0.12%	0.01%	3.85	3.87	3.95	0.025
	Inst. 07	1017.50	1000	1017.50	1017.5	1017.5	1017.5	0.000	0.00%	0.00%	0.00%	0.00%	3.85	3.86	3.88	0.008
	Inst. 08	1001.00	1000	1001.00	1001.8	1001.8	1001.8	0.000	0.07%	0.07%	0.07%	0.00%	3.85	3.87	3.93	0.023
	Inst. 09	1010.00	1000	1010.00	1011.0	1011.0	1011.0	0.000	0.10%	0.10%	0.10%	0.00%	3.84	3.86	3.87	0.007
	Inst. 10	1015.75	1000	1015.75	1016.8	1017.6	1017.8	0.379	0.10%	0.18%	0.20%	0.04%	3.85	3.86	3.88	0.008
	Crisp	1000	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	3.85	3.87	3.93	0.024
Average				1009.5	1009.5	1009.6	0.050	0.16%	0.17%	0.17%	0.00%	3.85	3.86	3.89	0.011	

6x6 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j6-per20-2	Inst. 01	1006.75	1000	1006.75	1008.5	1008.5	1008.5	0.000	0.17%	0.17%	0.17%	0.00%	4.20	4.21	4.26	0.011
	Inst. 02	1004.25	1000	1004.25	1005.5	1005.5	1005.5	0.000	0.12%	0.12%	0.12%	0.00%	4.20	4.24	4.32	0.032
	Inst. 03	1002.00	1000	1002.00	1005.3	1006.8	1007.5	0.903	0.32%	0.47%	0.55%	0.09%	4.22	4.29	4.33	0.021
	Inst. 04	1006.25	1000	1006.25	1006.3	1008.6	1008.8	0.634	0.00%	0.23%	0.25%	0.06%	4.21	4.23	4.32	0.030
	Inst. 05	1002.00	1000	1002.00	1002.5	1007.9	1008.5	1.831	0.05%	0.59%	0.65%	0.18%	4.27	4.28	4.32	0.012
	Inst. 06	1000.75	1000	1000.75	1001.8	1008.6	1009.3	1.930	0.10%	0.78%	0.85%	0.19%	4.19	4.22	4.25	0.017
	Inst. 07	1005.25	1000	1005.25	1011.0	1011.0	1011.0	0.000	0.57%	0.57%	0.57%	0.00%	4.19	4.21	4.26	0.015
	Inst. 08	1008.25	1000	1008.25	1008.8	1008.8	1008.8	0.000	0.05%	0.05%	0.05%	0.00%	4.20	4.22	4.24	0.015
	Inst. 09	1005.75	1000	1005.75	1008.3	1010.5	1010.8	0.639	0.25%	0.48%	0.50%	0.06%	4.22	4.25	4.28	0.015
	Inst. 10	1003.50	1000	1003.50	1009.0	1010.9	1011.3	0.853	0.55%	0.74%	0.77%	0.08%	4.20	4.26	4.29	0.022
	Crisp	1000	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	4.23	4.25	4.31	0.019
	Average				1006.7	1008.7	1009.0	0.679	0.22%	0.42%	0.45%	0.07%	4.21	4.24	4.29	0.019

7x7 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j7-per0-0	Inst. 01	1018.00	Unknown	1018.00	1061.0	1072.3	1076.3	4.426	4.22%	5.34%	5.72%	0.43%	10.07	10.11	10.19	0.025
	Inst. 02	1012.00	Unknown	1012.00	1064.8	1070.0	1081.0	4.461	5.21%	5.73%	6.82%	0.44%	10.09	10.11	10.13	0.011
	Inst. 03	1014.75	Unknown	1014.75	1061.0	1070.8	1078.3	4.694	4.56%	5.52%	6.26%	0.46%	10.08	10.11	10.16	0.015
	Inst. 04	1011.50	Unknown	1011.50	1061.5	1071.3	1079.8	5.235	4.94%	5.91%	6.75%	0.52%	10.12	10.19	10.25	0.038
	Inst. 05	1016.50	Unknown	1016.50	1063.0	1072.7	1078.3	5.166	4.57%	5.53%	6.07%	0.51%	10.09	10.14	10.22	0.032
	Inst. 06	1017.25	Unknown	1017.25	1065.3	1071.4	1078.8	3.165	4.72%	5.32%	6.05%	0.31%	10.09	10.14	10.20	0.027
	Inst. 07	1014.00	Unknown	1014.00	1065.3	1072.1	1078.5	3.849	5.05%	5.73%	6.36%	0.38%	10.10	10.13	10.15	0.011
	Inst. 08	1018.75	Unknown	1018.75	1061.5	1071.6	1085.3	6.577	4.20%	5.19%	6.53%	0.65%	10.10	10.15	10.22	0.030
	Inst. 09	1020.00	Unknown	1020.00	1070.3	1075.2	1082.0	2.495	4.93%	5.42%	6.08%	0.24%	10.08	10.15	10.19	0.032
	Inst. 10	1015.25	Unknown	1015.25	1063.5	1069.8	1079.3	4.782	4.75%	5.37%	6.30%	0.47%	10.09	10.15	10.24	0.033
	Crisp	1000	Unknown	1000.00	1051.0	1061.2	1070.0	7.207	5.10%	6.12%	7.00%	0.72%	10.13	10.17	10.22	0.028
Average				1063.7	1071.7	1079.7	4.485	4.72%	5.50%	6.29%	0.44%	10.09	10.14	10.20	0.025	
j7-per0-1	Inst. 01	1019.00	1055	1055.00	1076.0	1079.0	1085.5	2.124	1.99%	2.28%	2.89%	0.20%	10.14	10.16	10.29	0.029
	Inst. 02	1012.75	1055	1055.00	1070.3	1077.8	1082.3	3.006	1.45%	2.16%	2.58%	0.28%	10.14	10.18	10.22	0.019
	Inst. 03	1020.75	1055	1055.00	1075.0	1079.0	1086.0	3.515	1.90%	2.27%	2.94%	0.33%	10.12	10.16	10.22	0.028
	Inst. 04	1010.00	1055	1055.00	1068.0	1074.1	1079.3	3.928	1.23%	1.81%	2.30%	0.37%	10.13	10.16	10.28	0.031
	Inst. 05	1015.50	1055	1055.00	1073.5	1077.5	1081.0	1.300	1.75%	2.13%	2.46%	0.12%	10.14	10.17	10.22	0.016
	Inst. 06	1017.50	1055	1055.00	1072.0	1079.0	1083.3	3.957	1.61%	2.28%	2.68%	0.38%	10.15	10.19	10.25	0.030
	Inst. 07	1015.00	1055	1055.00	1067.5	1072.4	1079.8	2.481	1.18%	1.65%	2.35%	0.24%	10.13	10.17	10.24	0.029
	Inst. 08	1019.50	1055	1055.00	1077.5	1079.6	1085.5	1.338	2.13%	2.33%	2.89%	0.13%	10.13	10.15	10.23	0.023
	Inst. 09	1018.25	1055	1055.00	1073.0	1079.6	1086.0	3.705	1.71%	2.33%	2.94%	0.35%	10.12	10.14	10.17	0.013
	Inst. 10	1011.75	1055	1055.00	1073.0	1075.5	1082.0	2.868	1.71%	1.94%	2.56%	0.27%	10.13	10.17	10.21	0.019
	Crisp	1000	1055	1055.00	1064.0	1069.2	1077.0	3.782	0.85%	1.35%	2.09%	0.36%	10.13	10.17	10.26	0.027
Average				1072.6	1077.4	1083.1	2.822	1.67%	2.12%	2.66%	0.27%	10.13	10.17	10.23	0.024	
j7-per0-2	Inst. 01	1018.75	1056	1056.00	1073.0	1077.8	1079.8	2.503	1.61%	2.07%	2.25%	0.24%	9.83	10.12	10.20	0.114
	Inst. 02	1014.75	1056	1056.00	1072.0	1074.1	1079.5	2.205	1.52%	1.71%	2.23%	0.21%	9.74	10.14	10.31	0.087
	Inst. 03	1021.00	1056	1056.00	1074.8	1081.9	1088.0	3.766	1.78%	2.45%	3.03%	0.36%	9.65	10.14	10.35	0.113
	Inst. 04	1017.75	1056	1056.00	1070.5	1075.7	1084.0	4.266	1.37%	1.87%	2.65%	0.40%	9.65	9.93	10.18	0.217
	Inst. 05	1011.75	1056	1056.00	1066.5	1076.1	1081.8	4.462	0.99%	1.90%	2.44%	0.42%	9.65	9.86	10.19	0.232
	Inst. 06	1020.75	1056	1056.00	1070.8	1078.4	1086.0	2.697	1.40%	2.12%	2.84%	0.26%	9.63	9.65	9.69	0.017
	Inst. 07	1013.00	1056	1056.00	1068.5	1076.4	1080.0	2.590	1.18%	1.93%	2.27%	0.25%	9.67	9.70	9.79	0.028
	Inst. 08	1014.00	1056	1056.00	1067.0	1075.6	1078.0	3.153	1.04%	1.86%	2.08%	0.30%	9.62	9.65	9.72	0.019
	Inst. 09	1018.75	1056	1056.00	1067.3	1075.6	1083.0	5.672	1.07%	1.86%	2.56%	0.54%	9.65	9.68	9.79	0.033
	Inst. 10	1011.50	1056	1056.00	1067.0	1077.3	1083.5	4.722	1.04%	2.01%	2.60%	0.45%	9.67	9.70	9.81	0.033
	Crisp	1000	1056	1056.00	1059.0	1068.3	1073.0	4.641	0.28%	1.17%	1.61%	0.44%	9.64	9.76	9.89	0.092
Average				1069.7	1076.9	1082.4	3.604	1.30%	1.98%	2.50%	0.34%	9.68	9.86	10.00	0.089	
j7-per10-0	Inst. 01	1021.75	1013	1021.75	1036.0	1036.3	1036.5	0.252	1.39%	1.42%	1.44%	0.02%	9.26	9.36	9.51	0.083
	Inst. 02	1009.50	1013	1013.00	1026.8	1028.3	1041.8	2.913	1.36%	1.51%	2.84%	0.29%	9.28	9.32	9.39	0.026
	Inst. 03	1000.00	1013	1013.00	1029.0	1031.8	1034.3	1.842	1.58%	1.85%	2.10%	0.18%	9.27	9.34	9.52	0.068
	Inst. 04	1002.75	1013	1013.00	1025.5	1027.2	1035.0	3.010	1.23%	1.41%	2.17%	0.30%	9.29	9.33	9.48	0.038
	Inst. 05	1002.75	1013	1013.00	1025.5	1026.0	1031.8	1.258	1.23%	1.28%	1.85%	0.12%	9.27	9.31	9.40	0.023
	Inst. 06	1001.00	1013	1013.00	1028.8	1031.5	1034.0	1.355	1.55%	1.83%	2.07%	0.13%	9.27	9.32	9.44	0.034
	Inst. 07	1004.75	1013	1013.00	1025.3	1028.2	1036.8	3.819	1.21%	1.50%	2.34%	0.38%	9.28	9.32	9.40	0.031
	Inst. 08	1005.50	1013	1013.00	1031.0	1032.3	1039.0	2.627	1.78%	1.91%	2.57%	0.26%	9.32	9.38	9.56	0.054
	Inst. 09	1018.00	1013	1018.00	1032.5	1033.5	1044.8	2.548	1.42%	1.53%	2.63%	0.25%	9.33	9.39	9.53	0.061
	Inst. 10	1000.25	1013	1013.00	1025.0	1026.9	1036.0	3.556	1.18%	1.37%	2.27%	0.35%	9.25	9.29	9.32	0.017
	Crisp	1000	1013	1013.00	1017.0	1021.8	1031.0	3.461	0.39%	0.87%	1.78%	0.34%	9.33	9.37	9.51	0.042
Average				1028.5	1030.2	1037.0	2.318	1.39%	1.56%	2.23%	0.23%	9.28	9.34	9.46	0.044	

7x7 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j7-per10-1	Inst. 01	1007.25	1000	1007.25	1021.0	1021.1	1022.8	0.320	1.37%	1.37%	1.54%	0.03%	9.61	9.76	9.82	0.062
	Inst. 02	1000.00	1000	1000.00	1010.5	1010.7	1016.8	1.141	1.05%	1.07%	1.68%	0.11%	9.65	9.73	9.85	0.080
	Inst. 03	1001.00	1000	1001.00	1018.8	1019.0	1020.8	0.688	1.77%	1.80%	1.97%	0.07%	9.67	9.75	9.90	0.061
	Inst. 04	1001.25	1000	1001.25	1014.0	1014.0	1014.0	0.000	1.27%	1.27%	1.27%	0.00%	9.63	9.67	9.86	0.070
	Inst. 05	1001.50	1000	1001.50	1010.5	1010.5	1010.5	0.000	0.90%	0.90%	0.90%	0.00%	9.65	9.69	9.82	0.041
	Inst. 06	1001.00	1000	1001.00	1020.5	1021.7	1024.5	1.186	1.95%	2.07%	2.35%	0.12%	9.60	9.65	9.77	0.035
	Inst. 07	1002.00	1000	1002.00	1011.0	1012.5	1019.5	3.141	0.90%	1.05%	1.75%	0.31%	9.61	9.65	9.80	0.043
	Inst. 08	1007.75	1000	1007.75	1019.0	1019.2	1020.5	0.458	1.12%	1.13%	1.27%	0.05%	9.63	9.66	9.69	0.015
	Inst. 09	1014.00	1000	1014.00	1023.5	1023.9	1025.8	0.853	0.94%	0.97%	1.16%	0.08%	9.61	9.66	9.72	0.030
	Inst. 10	1002.75	1000	1002.75	1016.0	1016.7	1025.3	1.777	1.32%	1.39%	2.24%	0.18%	9.70	9.73	9.80	0.026
	Crisp	1000	1000	1000.00	1006.0	1007.0	1013.0	2.025	0.60%	0.70%	1.30%	0.20%	9.66	9.75	9.84	0.046
Average				1016.5	1016.9	1020.0	0.956	1.26%	1.30%	1.61%	0.10%	9.64	9.70	9.80	0.046	
j7-per10-2	Inst. 01	1009.50	1011	1011.00	1029.8	1031.8	1039.8	2.987	1.85%	2.06%	2.84%	0.30%	9.61	9.64	9.73	0.025
	Inst. 02	1009.75	1011	1011.00	1025.8	1029.5	1040.5	4.552	1.46%	1.83%	2.92%	0.45%	9.63	9.65	9.69	0.016
	Inst. 03	1014.25	1011	1014.25	1030.5	1032.3	1043.0	2.599	1.60%	1.78%	2.83%	0.26%	9.62	9.65	9.68	0.016
	Inst. 04	1006.00	1011	1011.00	1025.0	1031.8	1038.0	3.727	1.38%	2.06%	2.67%	0.37%	9.64	9.68	9.71	0.021
	Inst. 05	1003.75	1011	1011.00	1026.3	1030.7	1040.0	3.997	1.51%	1.95%	2.87%	0.40%	9.64	9.66	9.68	0.014
	Inst. 06	1008.50	1011	1011.00	1027.5	1030.0	1040.5	3.678	1.63%	1.88%	2.92%	0.36%	9.61	9.65	9.68	0.015
	Inst. 07	1013.25	1011	1013.25	1031.3	1034.6	1042.3	2.002	1.78%	2.11%	2.86%	0.20%	9.62	9.64	9.66	0.013
	Inst. 08	1006.50	1011	1011.00	1027.8	1030.2	1041.0	3.201	1.66%	1.90%	2.97%	0.32%	9.60	9.64	9.69	0.018
	Inst. 09	1012.25	1011	1012.25	1030.0	1033.2	1041.0	3.174	1.75%	2.06%	2.84%	0.31%	9.62	9.65	9.68	0.015
	Inst. 10	1004.25	1011	1011.00	1027.0	1029.9	1035.3	3.472	1.58%	1.87%	2.40%	0.34%	9.63	9.67	9.71	0.019
	Crisp	1000	1011	1011.00	1020.0	1022.8	1026.0	2.788	0.89%	1.16%	1.48%	0.28%	9.72	9.74	9.76	0.013
Average				1028.1	1031.4	1040.1	3.339	1.62%	1.95%	2.81%	0.33%	9.62	9.65	9.69	0.017	
j7-per20-0	Inst. 01	1000.75	1000	1000.75	1000.8	1000.8	1001.8	0.193	0.00%	0.01%	0.10%	0.02%	9.64	9.67	9.69	0.013
	Inst. 02	1000.00	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	9.62	9.65	9.69	0.017
	Inst. 03	1000.00	1000	1000.00	1000.0	1000.5	1001.3	0.385	0.00%	0.05%	0.13%	0.04%	9.62	9.66	9.68	0.014
	Inst. 04	1000.00	1000	1000.00	1000.0	1000.3	1001.5	0.400	0.00%	0.03%	0.15%	0.04%	9.60	9.63	9.67	0.018
	Inst. 05	1000.00	1000	1000.00	1000.0	1000.0	1000.8	0.143	0.00%	0.00%	0.08%	0.01%	9.62	9.65	9.70	0.015
	Inst. 06	1000.50	1000	1000.50	1000.5	1000.8	1002.5	0.571	0.00%	0.03%	0.20%	0.06%	9.61	9.64	9.65	0.012
	Inst. 07	1005.50	1000	1005.50	1005.5	1005.5	1005.5	0.000	0.00%	0.00%	0.00%	0.00%	9.64	9.66	9.69	0.012
	Inst. 08	1000.00	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	9.60	9.63	9.65	0.014
	Inst. 09	1000.00	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	9.67	9.70	9.72	0.014
	Inst. 10	1000.00	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	9.70	9.73	9.76	0.014
	Crisp	1000	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	9.65	9.66	9.68	0.008
Average				1000.7	1000.8	1001.3	0.169	0.00%	0.01%	0.06%	0.02%	9.63	9.66	9.69	0.014	
j7-per20-1	Inst. 01	1012.00	1005	1012.00	1025.3	1027.6	1034.0	3.154	1.31%	1.54%	2.17%	0.31%	9.88	9.91	9.94	0.017
	Inst. 02	1006.50	1005	1006.50	1019.0	1025.7	1033.3	3.356	1.24%	1.90%	2.66%	0.33%	9.63	9.66	9.69	0.015
	Inst. 03	1013.25	1005	1013.25	1028.3	1032.3	1036.0	2.823	1.48%	1.88%	2.25%	0.28%	9.62	9.68	9.74	0.031
	Inst. 04	1020.75	1005	1020.75	1032.8	1035.2	1039.3	1.746	1.18%	1.42%	1.81%	0.17%	9.63	9.68	9.73	0.028
	Inst. 05	1009.75	1005	1009.75	1021.8	1025.0	1028.3	2.728	1.19%	1.51%	1.83%	0.27%	9.63	9.65	9.66	0.008
	Inst. 06	1012.25	1005	1012.25	1021.8	1025.7	1030.5	3.005	0.94%	1.33%	1.80%	0.30%	9.62	9.65	9.68	0.015
	Inst. 07	1004.50	1005	1005.00	1023.0	1025.8	1032.3	2.299	1.79%	2.07%	2.71%	0.23%	9.65	9.70	9.87	0.041
	Inst. 08	1005.75	1005	1005.75	1017.8	1026.0	1030.0	2.903	1.19%	2.01%	2.41%	0.29%	9.62	9.65	9.68	0.017
	Inst. 09	1020.75	1005	1020.75	1029.8	1031.4	1038.0	3.011	0.88%	1.04%	1.69%	0.30%	9.61	9.65	9.69	0.015
	Inst. 10	1006.00	1005	1006.00	1022.5	1028.2	1031.8	1.520	1.64%	2.20%	2.56%	0.15%	9.61	9.63	9.65	0.013
	Crisp	1000	1005	1005.00	1016.0	1019.7	1026.0	2.288	1.09%	1.47%	2.09%	0.23%	9.72	9.75	9.87	0.026
Average				1024.2	1028.3	1033.3	2.655	1.28%	1.69%	2.19%	0.26%	9.65	9.69	9.73	0.020	

7x7 Problems																	
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)				
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev	
j7-per20-2	Inst. 01	1008.50	1003	1008.50	1016.5	1021.5	1026.8	3.386	0.79%	1.29%	1.81%	0.34%	9.59	9.66	9.73	0.043	
	Inst. 02	1003.25	1003	1003.25	1013.8	1015.9	1026.5	3.162	1.05%	1.26%	2.32%	0.32%	9.63	9.67	9.72	0.017	
	Inst. 03	1007.25	1003	1007.25	1018.5	1025.6	1032.0	2.638	1.12%	1.82%	2.46%	0.26%	9.63	9.66	9.68	0.012	
	Inst. 04	1002.50	1003	1003.00	1016.5	1021.6	1027.5	2.826	1.35%	1.86%	2.44%	0.28%	9.63	9.65	9.68	0.011	
	Inst. 05	1002.00	1003	1003.00	1011.3	1020.1	1027.3	2.949	0.82%	1.70%	2.42%	0.29%	9.65	9.68	9.70	0.015	
	Inst. 06	1001.00	1003	1003.00	1018.5	1024.1	1029.0	2.450	1.55%	2.11%	2.59%	0.24%	9.61	9.66	9.68	0.016	
	Inst. 07	1008.25	1003	1008.25	1018.3	1023.9	1029.8	3.443	0.99%	1.55%	2.13%	0.34%	9.62	9.65	9.66	0.013	
	Inst. 08	1003.50	1003	1003.50	1014.5	1023.0	1026.3	2.650	1.10%	1.95%	2.27%	0.26%	9.63	9.66	9.68	0.015	
	Inst. 09	1007.75	1003	1007.75	1018.8	1021.5	1026.3	1.342	1.09%	1.37%	1.84%	0.13%	9.62	9.65	9.67	0.013	
	Inst. 10	1007.25	1003	1007.25	1016.5	1021.0	1026.3	2.411	0.92%	1.36%	1.89%	0.24%	9.62	9.65	9.68	0.015	
	Crisp	1000	1003	1003.00	1008.0	1014.0	1024.0	3.311	0.50%	1.10%	2.09%	0.33%	9.65	9.67	9.69	0.011	
	Average				1016.3	1021.8	1027.8	2.726	1.08%	1.63%	2.22%	0.27%	9.62	9.66	9.69	0.017	

8x8 Problems																
Problem	Fuzzy instance	Lower Bound			E[Makespan]				%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev
j8-per0-1	Inst. 01	1023.25	Unknown	1023.25	1056.0	1072.4	1083.5	5.514	3.20%	4.80%	5.89%	0.54%	19.84	19.93	20.07	0.052
	Inst. 02	1018.50	Unknown	1018.50	1065.8	1074.3	1084.5	5.144	4.64%	5.47%	6.48%	0.51%	19.86	19.92	20.14	0.049
	Inst. 03	1016.00	Unknown	1016.00	1061.8	1072.3	1081.8	4.763	4.50%	5.54%	6.47%	0.47%	19.81	19.89	20.00	0.043
	Inst. 04	1017.00	Unknown	1017.00	1065.0	1073.3	1085.0	6.075	4.72%	5.53%	6.69%	0.60%	19.81	19.96	20.02	0.060
	Inst. 05	1015.50	Unknown	1015.50	1058.5	1070.8	1079.0	5.480	4.23%	5.44%	6.25%	0.54%	19.80	19.88	19.95	0.028
	Inst. 06	1016.50	Unknown	1016.50	1061.5	1071.8	1081.5	5.054	4.43%	5.44%	6.39%	0.50%	19.85	19.96	20.10	0.071
	Inst. 07	1013.00	Unknown	1013.00	1057.3	1070.4	1081.3	6.595	4.37%	5.67%	6.74%	0.65%	19.82	19.90	20.09	0.069
	Inst. 08	1015.00	Unknown	1015.00	1062.3	1070.8	1078.5	4.485	4.66%	5.50%	6.26%	0.44%	19.84	19.89	19.94	0.024
	Inst. 09	1025.75	Unknown	1025.75	1071.5	1077.6	1082.5	2.614	4.46%	5.06%	5.53%	0.25%	19.82	19.89	19.92	0.019
	Inst. 10	1012.75	Unknown	1012.75	1062.3	1070.9	1081.8	5.736	4.89%	5.74%	6.81%	0.57%	19.84	19.88	19.95	0.025
	Crisp	1000	Unknown	1000.00	1047.0	1062.1	1071.0	5.800	4.70%	6.21%	7.10%	0.58%	18.94	19.84	19.97	0.257
Average				1062.2	1072.5	1081.9	5.146	4.41%	5.42%	6.35%	0.51%	19.83	19.91	20.02	0.044	
j8-per0-2	Inst. 01	1021.25	Unknown	1021.25	1075.8	1079.7	1090.0	4.192	5.34%	5.72%	6.73%	0.41%	19.35	19.60	20.40	0.290
	Inst. 02	1019.50	Unknown	1019.50	1068.8	1077.8	1084.3	4.467	4.83%	5.72%	6.35%	0.44%	19.41	19.90	20.57	0.391
	Inst. 03	1016.50	Unknown	1016.50	1069.8	1075.6	1088.3	5.647	5.24%	5.82%	7.06%	0.56%	19.41	19.99	20.58	0.459
	Inst. 04	1014.50	Unknown	1014.50	1068.3	1073.6	1086.8	6.620	5.30%	5.83%	7.12%	0.65%	19.38	19.55	19.75	0.104
	Inst. 05	1014.00	Unknown	1014.00	1066.8	1073.9	1083.8	5.210	5.20%	5.91%	6.88%	0.51%	19.35	19.46	19.75	0.100
	Inst. 06	1016.75	Unknown	1016.75	1074.8	1078.1	1086.3	4.084	5.70%	6.04%	6.84%	0.40%	19.37	19.45	19.65	0.071
	Inst. 07	1013.75	Unknown	1013.75	1073.3	1076.0	1083.8	2.401	5.87%	6.14%	6.91%	0.24%	19.35	19.42	19.65	0.063
	Inst. 08	1014.75	Unknown	1014.75	1075.5	1079.7	1088.8	4.118	5.99%	6.40%	7.29%	0.41%	19.37	19.49	19.78	0.106
	Inst. 09	1020.75	Unknown	1020.75	1073.3	1078.1	1086.8	4.615	5.14%	5.61%	6.47%	0.45%	19.40	19.48	19.58	0.049
	Inst. 10	1020.75	Unknown	1020.75	1076.0	1081.0	1086.5	2.645	5.41%	5.90%	6.44%	0.26%	19.36	19.48	19.75	0.103
	Crisp	1000	Unknown	1000.00	1062.0	1065.9	1074.0	3.487	6.20%	6.59%	7.40%	0.35%	19.37	19.44	19.70	0.059
Average				1072.2	1077.4	1086.5	4.400	5.40%	5.91%	6.81%	0.43%	19.38	19.58	19.95	0.174	
j8-per10-0	Inst. 01	1014.50	Unknown	1014.50	1042.0	1049.8	1055.8	2.433	2.71%	3.48%	4.07%	0.24%	19.47	19.68	19.87	0.131
	Inst. 02	1007.25	Unknown	1007.25	1036.3	1046.3	1053.0	2.927	2.88%	3.88%	4.54%	0.29%	19.40	19.58	19.80	0.121
	Inst. 03	1019.50	Unknown	1019.50	1047.0	1049.7	1056.5	2.329	2.70%	2.97%	3.63%	0.23%	19.36	19.44	19.65	0.048
	Inst. 04	1022.75	Unknown	1022.75	1051.0	1053.1	1055.5	1.006	2.76%	2.96%	3.20%	0.10%	19.38	19.49	19.82	0.124
	Inst. 05	1014.75	Unknown	1014.75	1046.8	1050.6	1053.0	1.677	3.15%	3.53%	3.77%	0.17%	19.37	19.45	19.81	0.108
	Inst. 06	1017.75	Unknown	1017.75	1046.8	1050.2	1053.5	2.164	2.85%	3.19%	3.51%	0.21%	19.33	19.46	19.70	0.106
	Inst. 07	1013.75	Unknown	1013.75	1045.5	1048.4	1061.0	3.366	3.13%	3.41%	4.66%	0.33%	19.35	19.39	19.45	0.024
	Inst. 08	1008.25	Unknown	1008.25	1044.3	1049.6	1057.0	4.129	3.57%	4.10%	4.84%	0.41%	19.32	19.40	19.43	0.024
	Inst. 09	1016.50	Unknown	1016.50	1044.3	1048.9	1054.5	2.046	2.73%	3.19%	3.74%	0.20%	19.38	19.43	19.47	0.024
	Inst. 10	1017.00	Unknown	1017.00	1047.8	1053.0	1057.3	2.530	3.02%	3.54%	3.96%	0.25%	19.36	19.41	19.45	0.025
	Crisp	1000	Unknown	1000.00	1035.0	1039.8	1045.0	1.789	3.50%	3.98%	4.50%	0.18%	19.42	19.46	19.51	0.022
Average				1045.2	1050.0	1055.7	2.461	2.95%	3.43%	3.99%	0.24%	19.37	19.47	19.65	0.073	
j8-per10-1	Inst. 01	1011.75	Unknown	1011.75	1020.3	1028.4	1035.0	4.382	0.84%	1.65%	2.30%	0.43%	19.33	19.39	19.44	0.026
	Inst. 02	1007.75	Unknown	1007.75	1024.8	1030.1	1035.3	3.389	1.69%	2.22%	2.73%	0.34%	19.39	19.45	19.62	0.040
	Inst. 03	1007.50	Unknown	1007.50	1022.8	1030.3	1036.3	3.607	1.51%	2.27%	2.85%	0.36%	19.38	19.44	19.48	0.024
	Inst. 04	1004.25	Unknown	1004.25	1024.3	1029.7	1037.3	3.045	1.99%	2.53%	3.29%	0.30%	19.36	19.41	19.47	0.029
	Inst. 05	1004.25	Unknown	1004.25	1022.3	1029.1	1034.8	3.640	1.79%	2.48%	3.04%	0.36%	19.37	19.43	19.47	0.023
	Inst. 06	1004.00	Unknown	1004.00	1020.5	1028.0	1035.0	4.481	1.64%	2.39%	3.09%	0.45%	19.38	19.44	19.49	0.033
	Inst. 07	1006.75	Unknown	1006.75	1013.8	1028.6	1034.3	5.450	0.70%	2.17%	2.73%	0.54%	19.38	19.49	19.62	0.058
	Inst. 08	1003.25	Unknown	1003.25	1028.0	1032.1	1039.0	2.774	2.47%	2.88%	3.56%	0.28%	19.37	19.42	19.46	0.023
	Inst. 09	1008.75	Unknown	1008.75	1022.5	1030.8	1035.3	3.312	1.36%	2.18%	2.63%	0.33%	19.40	19.45	19.53	0.032
	Inst. 10	1001.00	Unknown	1001.00	1022.5	1030.9	1036.3	3.154	2.15%	2.99%	3.52%	0.32%	19.35	19.41	19.50	0.028
	Crisp	1000	Unknown	1000.00	1011.0	1020.1	1027.0	3.854	1.10%	2.01%	2.70%	0.39%	19.39	19.42	19.47	0.021
Average				1022.2	1029.8	1035.8	3.723	1.61%	2.38%	2.97%	0.37%	19.37	19.43	19.51	0.032	

8x8 Problems																	
Problem	Fuzzy instance	Lower Bound			E[Makespan]					%RE				Runtime (sec)			
		LB _f	LB _c	LB	Best	Average	Worst	StDev	Best	Average	Worst	StDev	Best	Average	Worst	StDev	
j8-per10-2	Inst. 01	1003.00	Unknown	1003.00	1013.8	1031.3	1041.3	6.393	1.07%	2.82%	3.81%	0.64%	19.39	19.46	19.57	0.056	
	Inst. 02	1006.00	Unknown	1006.00	1016.3	1030.6	1042.8	7.625	1.02%	2.45%	3.65%	0.76%	19.39	19.48	19.60	0.062	
	Inst. 03	1004.75	Unknown	1004.75	1016.0	1031.1	1040.0	5.801	1.12%	2.63%	3.51%	0.58%	19.37	19.47	19.55	0.055	
	Inst. 04	1009.75	Unknown	1009.75	1017.8	1034.6	1042.5	5.989	0.79%	2.46%	3.24%	0.59%	19.36	19.42	19.47	0.029	
	Inst. 05	1005.00	Unknown	1005.00	1020.8	1033.2	1043.5	5.572	1.57%	2.81%	3.83%	0.55%	19.37	19.43	19.48	0.024	
	Inst. 06	1006.25	Unknown	1006.25	1020.0	1030.7	1037.5	5.555	1.37%	2.43%	3.11%	0.55%	19.37	19.44	19.50	0.027	
	Inst. 07	1009.00	Unknown	1009.00	1029.8	1034.6	1042.3	3.263	2.06%	2.53%	3.30%	0.32%	19.40	19.45	19.48	0.022	
	Inst. 08	1007.75	Unknown	1007.75	1021.3	1034.7	1042.3	4.694	1.34%	2.67%	3.42%	0.47%	19.40	19.51	19.63	0.067	
	Inst. 09	1003.25	Unknown	1003.25	1016.3	1032.9	1042.8	6.733	1.30%	2.95%	3.94%	0.67%	19.37	19.44	19.49	0.025	
	Inst. 10	1003.75	Unknown	1003.75	1022.8	1031.5	1040.5	5.283	1.89%	2.76%	3.66%	0.53%	19.35	19.43	19.70	0.057	
	Crisp	1000	Unknown	1000.00	1003.0	1024.2	1031.0	6.243	0.30%	2.42%	3.10%	0.62%	19.54	19.61	19.65	0.026	
Average				1019.5	1032.5	1041.5	5.691	1.35%	2.65%	3.55%	0.57%	19.38	19.45	19.55	0.043		
j8-per20-0	Inst. 01	1003.75	1000	1003.75	1009.5	1013.6	1018.3	2.511	0.57%	0.98%	1.44%	0.25%	19.55	19.59	19.71	0.031	
	Inst. 02	1003.25	1000	1003.25	1007.3	1012.8	1019.8	2.974	0.40%	0.95%	1.64%	0.30%	19.39	19.43	19.48	0.027	
	Inst. 03	1007.25	1000	1007.25	1010.8	1016.3	1021.3	2.883	0.35%	0.90%	1.39%	0.29%	19.36	19.40	19.44	0.023	
	Inst. 04	1007.75	1000	1007.75	1012.3	1016.1	1024.0	2.460	0.45%	0.83%	1.61%	0.24%	19.37	19.45	19.55	0.056	
	Inst. 05	1004.75	1000	1004.75	1005.5	1013.8	1020.5	3.450	0.07%	0.90%	1.57%	0.34%	19.35	19.41	19.44	0.025	
	Inst. 06	1002.50	1000	1002.50	1011.3	1015.5	1020.8	2.359	0.87%	1.30%	1.82%	0.24%	19.36	19.43	19.47	0.027	
	Inst. 07	1009.25	1000	1009.25	1011.3	1015.6	1022.3	2.614	0.20%	0.63%	1.29%	0.26%	19.34	19.45	19.54	0.065	
	Inst. 08	1012.00	1000	1012.00	1018.3	1022.3	1029.0	2.895	0.62%	1.02%	1.68%	0.29%	19.39	19.49	19.58	0.045	
	Inst. 09	1008.50	1000	1008.50	1011.5	1016.1	1022.3	2.959	0.30%	0.75%	1.36%	0.29%	19.37	19.42	19.46	0.025	
	Inst. 10	1010.25	1000	1010.25	1011.3	1014.9	1019.5	2.112	0.10%	0.46%	0.92%	0.21%	19.40	19.44	19.48	0.022	
	Crisp	1000	1000	1000.00	1003.0	1007.5	1013.0	2.751	0.30%	0.75%	1.30%	0.28%	19.40	19.45	19.51	0.027	
Average				1010.9	1015.7	1021.8	2.722	0.39%	0.87%	1.47%	0.27%	19.39	19.45	19.52	0.035		
j8-per20-1	Inst. 01	1000.75	1000	1000.75	1000.8	1002.7	1005.0	1.072	0.00%	0.20%	0.42%	0.11%	19.41	19.56	19.61	0.041	
	Inst. 02	1000.00	1000	1000.00	1000.0	1000.7	1002.3	0.787	0.00%	0.07%	0.23%	0.08%	19.38	19.47	19.59	0.045	
	Inst. 03	1002.25	1000	1002.25	1002.3	1003.3	1005.0	0.737	0.00%	0.10%	0.27%	0.07%	19.34	19.42	19.49	0.030	
	Inst. 04	1000.00	1000	1000.00	1000.0	1000.7	1003.5	0.808	0.00%	0.07%	0.35%	0.08%	19.40	19.46	19.62	0.056	
	Inst. 05	1000.00	1000	1000.00	1000.0	1001.1	1003.0	0.870	0.00%	0.11%	0.30%	0.09%	19.38	19.45	19.54	0.030	
	Inst. 06	1000.00	1000	1000.00	1000.0	1001.4	1005.0	1.367	0.00%	0.14%	0.50%	0.14%	19.39	19.46	19.50	0.031	
	Inst. 07	1000.00	1000	1000.00	1000.0	1000.4	1001.3	0.374	0.00%	0.04%	0.13%	0.04%	19.38	19.46	19.66	0.066	
	Inst. 08	1000.00	1000	1000.00	1000.0	1001.9	1005.5	1.560	0.00%	0.19%	0.55%	0.16%	19.35	19.40	19.44	0.023	
	Inst. 09	1000.00	1000	1000.00	1000.0	1000.8	1004.3	0.910	0.00%	0.08%	0.43%	0.09%	19.37	19.43	19.63	0.050	
	Inst. 10	1000.00	1000	1000.00	1000.0	1001.1	1003.3	1.170	0.00%	0.11%	0.33%	0.12%	19.42	19.46	19.51	0.022	
	Crisp	1000	1000	1000.00	1000.0	1000.0	1000.0	0.000	0.00%	0.00%	0.00%	0.00%	19.38	19.47	19.58	0.061	
Average				1000.3	1001.4	1003.8	0.965	0.00%	0.11%	0.35%	0.10%	19.38	19.46	19.56	0.039		
j8-per20-2	Inst. 01	1003.50	1000	1003.50	1006.0	1013.5	1017.3	3.008	0.25%	0.99%	1.37%	0.30%	19.41	19.47	19.58	0.040	
	Inst. 02	1001.00	1000	1001.00	1005.0	1010.7	1015.3	2.206	0.40%	0.97%	1.42%	0.22%	19.38	19.46	19.64	0.063	
	Inst. 03	1008.75	1000	1008.75	1009.8	1013.3	1020.0	3.167	0.10%	0.45%	1.12%	0.31%	19.38	19.43	19.56	0.041	
	Inst. 04	1006.75	1000	1006.75	1011.5	1015.7	1021.0	2.920	0.47%	0.89%	1.42%	0.29%	19.40	19.45	19.49	0.020	
	Inst. 05	1004.50	1000	1004.50	1009.0	1013.7	1019.0	2.462	0.45%	0.91%	1.44%	0.25%	19.43	19.46	19.51	0.021	
	Inst. 06	1002.00	1000	1002.00	1006.5	1010.7	1016.0	2.701	0.45%	0.87%	1.40%	0.27%	19.39	19.42	19.47	0.022	
	Inst. 07	1005.25	1000	1005.25	1008.0	1013.2	1022.8	3.174	0.27%	0.79%	1.74%	0.32%	19.35	19.41	19.44	0.024	
	Inst. 08	1013.75	1000	1013.75	1017.3	1021.9	1027.3	3.411	0.35%	0.81%	1.33%	0.34%	19.44	19.52	19.60	0.038	
	Inst. 09	1006.75	1000	1006.75	1007.5	1013.4	1019.3	2.279	0.07%	0.66%	1.24%	0.23%	19.43	19.51	19.59	0.039	
	Inst. 10	1009.00	1000	1009.00	1009.8	1013.9	1018.0	2.460	0.07%	0.48%	0.89%	0.24%	19.39	19.51	19.66	0.047	
	Crisp	1000	1000	1000.00	1000.0	1004.5	1009.0	2.177	0.00%	0.45%	0.90%	0.22%	19.40	19.47	19.52	0.029	
Average				1009.0	1014.0	1019.6	2.779	0.29%	0.78%	1.34%	0.28%	19.40	19.46	19.55	0.036		