Table 3 Numerical results of three relaxation schemes for MDP with $\{n=20, l=30, m=60, p=50\}$

	MDP$_1$			MDP$_2$			MDP$_3$		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
1	3.21	5.24	47.29	-15.11	1.66	90.91	40.25	2.95	101.56
2	-16.50	0.96	18.81	-14.64	9.76	147.59	24.59	2.37	46.85
3	-54.60	2.16e-04	4.87	-54.60	2.16e-04	5.33	-21.08	2.81	42.06
4	-28.70	1.01e-08	2.90	-5.06	0.25	19.43	-20.62	6.13	42.31
5	-1.80	7.03e-13	1.95	25.80	3.14	147.19	-42.74	7.19	76.64
6	10.86	1.66	10.28	-34.82	0.48	29.33	-17.16	0.22	7.40
7	20.52	2.93	55.89	-3.74	0.31	16.74	-40.50	1.01	31.11
8	17.32	1.78	9.22	-5.38	9.47	86.92	-15.27	15.21	128.70
9	8.87	1.20e-08	2.84	42.17	12.56	29.28	3.57	4.20	122.05
10	4.16	7.04	12.78	-2.24	2.77	86.76	-30.92	1.98	60.47
11	-7.55	5.07	64.81	13.09	5.67	48.78	9.70	6.54	107.63
12	-0.95	6.01e-14	2.08	-0.95	6.01e-14	2.33	-0.95	6.01e-14	2.21
13	0.16	3.28e-04	11.21	-71.80	17.58	44.79	30.63	3.24e-04	9.42
14	0.37	7.93e-14	1.99	-44.80	4.45	34.25	-45.81	0.52	13.54
15	-24.56	8.37e-09	2.97	10.62	17.35	44.85	-17.21	3.53	21.58
16	0.44	0.02	17.47	4.38	2.04	89.14	37.74	1.36	16.73
17	46.60	0.06	13.44	9.81	1.72	23.61	3.47	1.10	48.34
18	-4.96	4.15	31.46	-29.62	3.94	132.39	20.32	18.32	108.12
19	-23.60	1.13e-08	2.88	12.16	2.80e-03	7.62	35.19	19.04	182.69
20	-34.03	0.05	7.79	-51.05	3.39	57.44	-16.07	2.17	43.02
21	-9.90	1.25e-13	2.00	-10.61	3.60	35.13	-25.32	0.01	20.95
22	-33.63	1.99	56.55	-20.19	2.76	63.10	-23.02	0.08	30.52
23	-43.99	0.65	29.05	18.15	0.51	26.66	-5.68	5.66	96.67
24	23.21	8.23e-09	2.85	-9.38	5.42	82.55	1.62	1.93	50.22
25	23.64	12.48	33.59	33.26	21.64	111.46	-7.42	9.19	127.90
26	-6.84	3.65	49.61	-73.68	7.15	220.10	20.67	2.43	41.97
27	23.22	1.39e-13	1.91	27.59	1.36	27.02	-19.50	10.90	45.82
28	-8.58	0.76	13.46	-35.49	2.38e-13	2.37	-1.08	10.60	71.47
29	-5.64	9.02	39.18	-38.64	22.54	6.42	-47.73	3.32	16.29
30	22.74	2.65	34.99	17.02	4.49	74.55	-48.64	8.14	87.50
31	11.94	5.45e-14	1.94	11.94	5.45e-14	2.60	11.94	5.45e-14	3.11
32	3.94	5.74e-04	8.29	-52.24	1.36	61.92	-43.71	1.48e-13	2.76
33	-4.91	0.10	6.13	-20.27	0.16	6.87	-2.21	0.07	8.84
34	6.90	2.31	26.87	-27.04	10.44	29.21	5.12	5.59	121.91
35	-24.57	2.66e-05	6.94	5.66	5.90	42.09	-15.33	11.06	25.32
36	3.07	1.27	29.22	-15.20	1.26	19.64	22.63	13.76	119.43
37	18.04	9.67e-09	2.87	-35.77	3.99	80.70	-12.16	1.37	40.79
38	-15.59	0.11	17.70	24.18	2.09e-13	1.92	0.90	5.99	135.73
39	-4.57	0.01	9.07	-69.18	11.67	80.64	1.37	4.20	105.87
40	-10.19	14.30	25.58	-64.78	1.63	39.10	9.81	11.86	55.49
41	10.59	2.72e-04	7.46	-2.77	8.12	124.90	-32.27	0.29	35.71
42	27.97	0.01	8.14	-0.09	0.03	6.92	-12.88	1.34	62.84
43	-47.87	4.13	12.66	-19.01	5.07	7.60	19.25	26.31	178.43
44	-30.98	0.25	36.20	-35.93	1.61e-13	2.01	-4.21	0.06	9.61
45	-15.85	8.38	11.80	-16.80	16.14	93.22	-26.13	2.15	20.85
46	22.06	27.90	23.05	-39.24	1.02e-13	2.22	5.46	9.98	187.49
47	-4.14	3.50	22.23	-37.85	22.84	61.59	-20.33	22.12	18.33
48	-0.80	1.35e-13	2.12	-0.80	1.35e-13	2.43	-0.80	1.35e-13	2.60
49	-42.24	2.53	18.88	-66.82	0.70	10.32	19.07	0.26	21.10
50	-10.46	7.50	22.08	-9.94	12.70	15.65	8.86	5.93	18.21

Table 4   **Numerical results of three relaxation schemes for MDP with** $\{n = 20, l = 30, m = 100, p = 110\}$

#	MDP$_1$			MDP$_2$			MDP$_3$		
	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
51	-55.75	8.55e-13	13.41	-43.66	8.35e-09	10.96	-43.66	8.35e-09	12.24
52	-22.64	2.36e-05	41.38	2.99	1.88e-05	50.03	24.39	0.05	63.49
53	-42.35	2.12	146.52	-39.97	0.20	91.40	-43.21	1.07e-12	8.06
54	30.74	2.11	156.74	24.77	2.50	182.76	1.66	1.16	40.64
55	-5.64	7.84e-13	8.48	-5.64	7.84e-13	8.41	-5.64	7.84e-13	8.12
56	-10.26	2.60	257.67	-83.59	24.78	201.80	-0.97	1.06e-04	25.68
57	-15.79	2.97e-13	10.22	1.67	2.69e-06	31.05	42.10	10.08	294.71
58	28.41	0.67	62.93	40.01	5.23	315.76	-40.65	6.21	593.94
59	12.36	7.01	84.31	2.83	4.85e-13	11.31	-71.00	1.51	167.91
60	10.50	2.24	132.66	-18.29	3.39	167.82	-23.03	11.35	74.50
61	-0.51	0.80	43.19	-14.90	3.11e-13	10.88	5.99	2.55	90.51
62	-6.40	1.85	266.01	-23.12	1.48	140.49	26.02	1.82	257.10
63	-0.98	1.43	22.58	50.85	0.53	72.69	20.87	1.23	206.51
64	-21.77	12.29	438.93	20.94	0.18	179.16	-53.69	0.93	225.94
65	-33.90	4.25	210.93	-21.28	1.12	118.03	-16.00	6.92	103.54
66	36.93	1.47	190.08	-86.89	0.75	57.39	5.81	12.80	232.15
67	-43.04	3.82	112.33	44.54	0.96	84.37	-11.40	6.51	115.66
68	-0.32	5.71e-09	10.08	-21.48	15.04	134.89	-32.27	2.19	326.42
69	-61.54	1.19e-12	7.98	-61.54	1.19e-12	15.14	-61.54	1.19e-12	11.02
70	-4.04	4.12e-06	23.01	-16.33	5.24e-13	12.35	-16.33	5.24e-13	11.38
71	-45.36	9.17e-13	8.41	-45.36	9.17e-13	13.57	-15.42	1.36	195.51
72	18.60	5.33e-05	26.53	20.89	7.46	580.93	4.74	0.50	210.54
73	-32.39	3.94e-06	49.07	16.04	8.11	248.05	-28.28	2.99	390.63
74	108.61	2.92e-12	8.53	67.46	1.35	139.49	-21.18	0.24	107.36
75	-19.06	4.30	136.13	-25.17	6.70e-13	12.22	-25.17	6.70e-13	10.87
76	-83.10	0.62	73.30	30.85	0.40	112.19	47.62	1.17	200.15
77	-14.80	3.49	25.35	-24.93	15.61	101.48	-25.12	16.53	105.32
78	11.90	19.69	253.52	102.22	7.23	239.46	22.19	0.01	63.03
79	-3.06	8.65e-09	10.67	20.51	3.82	174.29	34.55	3.13	102.77
80	33.69	0.02	43.53	-5.61	20.29	446.86	-54.81	14.65	211.29
81	-39.80	6.58e-13	8.22	27.01	3.90	266.44	-2.63	3.35	177.65
82	7.82	1.17	42.89	-48.51	0.81	153.55	51.87	2.24	124.75
83	18.02	7.54	109.11	-5.45	3.17	508.11	-13.10	11.83	71.91
84	28.87	2.19	75.76	3.76	1.82e-12	13.80	9.34	9.33	232.39
85	23.21	1.46	79.76	-23.41	0.01	201.03	-19.12	26.81	297.30
86	26.82	0.11	53.31	-19.91	45.59	387.31	29.94	0.42	121.27
87	15.08	9.06e-05	20.32	-14.52	13.25	442.35	48.58	1.84e-12	13.99
88	-22.40	0.30	56.49	80.48	7.88	53.26	15.07	5.80	100.93
89	31.95	0.57	55.24	37.26	0.36	178.64	53.15	1.38e-06	60.86
90	-6.59	4.08	150.14	-2.91	2.90e-04	35.91	-4.84	0.47	85.69
91	-46.51	1.17	91.73	25.76	4.04	145.06	-40.63	63.47	1053.53
92	-20.78	6.75e-13	7.91	-20.78	6.75e-13	15.85	-20.78	6.75e-13	14.09
93	14.06	1.53	9.94	-13.61	5.20	209.86	-57.41	7.77	142.38
94	-23.32	3.61	44.46	0.53	0.04	125.62	-20.78	5.45	333.79
95	50.67	1.56e-12	8.40	66.17	1.40	377.61	50.67	1.56e-12	12.68
96	14.80	6.85	121.42	87.46	0.83	168.27	-33.45	3.50	227.87
97	-22.12	7.21e-13	8.10	-22.12	7.21e-13	13.09	-22.12	7.21e-13	12.36
98	40.25	2.01	108.25	-18.83	6.88e-13	17.28	-4.13	5.99	128.20
99	-56.85	1.08e-05	81.21	-63.04	4.22	199.41	-26.69	8.80	279.63
100	0.16	1.50e-12	7.99	0.16	1.50e-12	13.30	5.18	5.17	132.21

Table 5   **Numerical results of three relaxation schemes for MDP with** $\{n = 20, l = 30, m = 160, p = 150\}$

	MDP_1			MDP_2			MDP_3		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
101	-2.82	2.89	500.21	8.90	15.40	372.11	-50.97	19.61	219.53
102	34.13	8.56e-09	35.47	-0.20	2.72	394.06	-78.73	2.07	946.63
103	-28.62	6.74e-04	107.01	19.71	0.93	770.67	-10.03	3.17	632.37
104	-22.94	2.44	792.97	4.86	0.25	974.11	-51.12	4.97	1664.67
105	-33.90	1.81	348.45	-63.54	3.54	533.71	-18.62	2.09e-05	166.49
106	-45.69	4.17	74.42	-36.25	0.37	176.91	-23.50	7.04	312.28
107	10.18	2.79e-12	35.55	10.18	2.79e-12	31.62	10.18	2.79e-12	30.63
108	60.31	1.52	932.70	37.96	13.88	878.09	-45.18	17.62	245.23
109	-58.48	5.47e-05	157.48	-73.64	4.11	1566.42	-98.58	2.81e-05	82.76
110	-31.98	1.96e-04	224.44	-117.16	0.15	270.32	0.20	0.24	569.39
111	-67.05	1.55	783.97	-32.48	3.24	298.65	-36.03	1.18	299.29
112	38.03	1.07e-04	98.76	29.12	0.11	101.68	3.36	1.93e-12	28.40
113	-9.62	8.76	1053.07	21.59	0.04	207.98	-72.84	0.19	248.61
114	-44.63	6.87	151.64	-23.94	8.55	1324.50	61.41	2.75	1164.86
115	-12.04	8.90	830.94	-79.68	1.31	107.06	-31.76	1.22e-09	63.45
116	-66.82	4.47e-04	165.91	74.33	1.93	231.54	-50.06	1.71e-12	29.35
117	-23.55	6.65e-05	85.48	-39.08	4.75	584.81	11.13	1.42	262.05
118	8.08	0.56	467.49	45.27	9.23	1391.97	2.66	0.14	156.34
119	-24.36	0.22	333.40	22.17	1.56e-04	94.69	-37.78	2.27	269.20
120	4.02	2.96e-12	31.55	4.02	2.96e-12	29.79	-83.77	19.81	381.15
121	37.90	1.12e-12	30.38	-1.56	3.21	2096.31	3.74	8.04	463.64
122	17.49	1.67	525.87	-74.72	2.32	433.23	-9.88	0.71	330.69
123	5.84	0.37	269.81	-101.14	0.27	342.02	-19.28	3.73	178.68
124	13.09	1.03	325.70	-4.49	4.03	575.28	-111.73	3.97	647.30
125	37.98	1.75	415.94	98.55	12.90	830.65	-12.22	1.60	280.75
126	-47.62	9.27e-05	165.68	-11.74	10.23	754.23	-28.42	2.31	770.39
127	-13.52	21.20	2939.47	-36.66	27.49	805.55	17.10	3.17	142.44
128	-40.96	0.02	76.37	62.57	4.89	1356.97	26.90	2.60	295.54
129	-20.79	7.84e-09	35.21	27.68	5.63	411.91	-10.95	0.90	377.85
130	-7.98	3.08	1245.48	22.07	0.91	74.21	4.08	1.44e-12	33.42
131	-16.26	7.04e-05	92.78	-40.09	25.29	350.14	-84.45	4.13e-12	34.28
132	6.51	3.35	1414.50	82.38	1.16	188.85	51.17	14.15	1229.70
133	14.16	9.11e-09	36.01	17.44	1.16	269.62	-27.34	0.92	209.47
134	-61.84	1.42	338.04	-83.26	2.75	925.81	3.37	30.17	627.78
135	10.43	17.74	809.42	24.12	1.88e-12	15.70	-33.44	0.10	213.42
136	-36.90	2.69	202.15	22.74	7.68	211.19	32.29	0.03	149.34
137	-31.30	13.48	1477.92	-111.95	8.47	80.59	-48.01	12.91	1328.17
138	-16.70	2.26e-12	30.66	-28.44	17.90	401.84	-16.70	2.26e-12	29.59
139	38.07	8.94	119.69	31.20	3.89	367.44	4.39	2.37	1045.35
140	15.18	8.12e-09	38.56	-2.76	19.40	777.35	22.66	3.68	896.97
141	9.05	0.61	111.08	13.99	3.35	333.78	-27.73	2.58	1498.39
142	0.19	29.36	638.53	-55.80	22.51	1195.94	10.19	1.06e-04	76.69
143	25.93	0.72	175.92	-43.36	1.86	178.56	7.24	3.15	932.33
144	-4.43	1.61e-12	32.35	-24.48	4.08	293.42	-4.43	1.61e-12	30.23
145	60.32	6.38e-05	97.68	-49.81	15.15	144.57	9.77	2.49	1054.55
146	15.52	1.25e-12	32.46	15.52	1.25e-12	30.14	-6.24	0.39	72.59
147	-26.83	36.96	500.38	88.41	21.84	1244.86	-11.70	4.90	953.65
148	-77.01	4.71	580.27	-35.87	3.48e-12	34.61	15.00	1.03	888.91
149	-20.24	1.98	453.02	63.80	1.13e-12	31.12	-1.70	1.09	1440.58
150	14.18	2.91e-12	30.06	59.36	3.86	343.10	14.18	2.91e-12	33.11

Table 6   Numerical results for MPCC with $\{n = 20, l = 30, m = 60, p = 50\}$

	Relaxation method			Direct method		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
1	-19.02	16.97	124.25	-0.05	114.17	5.85
2	-4.37	9.11	36.79	0	130.53	5.20
3	-30.06	12.41	183.81	-0.02	135.52	5.60
4	-46.63	3.58	8.98	-3.04e-06	138.53	8.74
5	-1.80	7.03e-13	7.67	0	148.46	5.63
6	-26.73	23.59	114.98	-1.02e-03	154.25	12.68
7	-14.69	21.63	146.23	0	112.78	4.91
8	-33.34	9.62	42.43	7.01e-04	165.74	14.79
9	2.49	0.01	6.59	-8.83e-04	112.52	10.16
10	23.79	29.81	358.02	-1.04e-03	119.37	6.58
11	12.46	0.17	12.11	-8.85e-06	127.46	8.99
12	-0.95	6.01e-14	1.59	-5.53e-05	125.18	3.36
13	-28.36	4.85	55.06	-0.01	128.56	19.28
14	21.79	0.01	14.65	2.11e-03	172.34	15.26
15	55.21	14.04	205.91	0	150.15	5.95
16	-37.30	1.93e-04	10.81	0.05	142.43	5.89
17	-33.44	5.31	21.73	0	150.06	5.26
18	-36.94	5.41	26.38	3.02e-05	129.46	6.52
19	-25.76	0.88	17.37	-0.01	148.70	8.94
20	-5.07	6.04	39.23	1.31e-04	150.61	3.64
21	-30.92	1.81	32.62	0.03	170.71	11.66
22	8.34	8.95	34.73	0.02	138.25	11.03
23	-56.84	8.42	214.65	-0.03	133.70	23.25
24	34.44	8.41	76.71	-4.69e-03	113.67	11.64
25	-13.75	5.39	14.28	-1.38e-03	152.02	15.42
26	-54.66	189.66	1.71	-6.55e-04	123.78	5.63
27	-72.26	0.55	11.48	-3.21e-05	172.04	10.58
28	-11.02	15.56	56.12	-6.38e-04	165.20	5.65
29	-31.42	22.20	187.02	0.01	121.39	11.16
30	25.26	18.36	197.32	-2.67e-03	156.13	8.36
31	11.94	5.45e-14	2.07	-3.75e-04	160.76	3.53
32	-15.59	15.20	103.30	0	132.79	5.08
33	-50.28	29.54	159.00	-4.63e-04	137.51	20.49
34	20.07	3.95	6.40	5.01e-04	126.81	6.29
35	1.73	14.09	86.90	-2.01e-03	137.51	13.25
36	-0.04	0.27	12.05	-9.38e-06	131.85	5.64
37	5.93	3.23	77.26	1.45e-04	126.00	4.74
38	6.19	16.60	66.20	-1.12e-06	172.42	9.47
39	24.08	10.08	79.29	-1.54e-03	142.04	10.12
40	0.61	31.90	128.86	-2.95e-05	142.46	5.68
41	22.09	5.79	17.72	-2.85e-03	110.13	3.75
42	-11.49	9.87e-14	1.86	-5.42e-03	161.21	13.34
43	-44.57	3.63	30.65	2.16e-04	178.46	3.72
44	1.66	20.97	119.30	8.19e-05	81.70	6.54
45	-38.10	22.74	116.56	3.49e-03	142.35	3.92
46	22.18	12.19	349.33	-2.23e-03	141.53	10.38
47	42.30	15.33	94.75	0	136.46	5.86
48	-0.80	1.35e-13	2.14	-5.22e-03	110.63	19.42
49	-25.03	0.07	6.70	-0.01	131.04	13.73
50	-13.67	1.64e-04	5.97	0.01	136.91	7.10

Table 7   **Numerical results for MPCC with** $\{n = 20, l = 30, m = 100, p = 110\}$

	Relaxation method			Direct method		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
51	-3.52	11.78	461.95	5.74e-04	182.30	28.93
52	-17.97	4.68e-13	5.83	-6.98e-06	205.57	40.66
53	3.21	1.28	37.06	0	182.11	50.22
54	11.38	24.13	271.87	0	198.36	42.68
55	-58.85	7.87	320.34	0.02	232.94	79.18
56	-37.34	0.01	52.31	-0.01	199.38	14.15
57	-15.79	2.97e-13	5.66	1.43e-03	266.74	73.79
58	-58.20	0.95	19.62	-1.59e-04	206.82	17.90
59	5.74	5.05	101.38	-1.33e-04	225.12	43.07
60	-6.73	0.06	34.72	8.77e-04	163.62	23.24
61	6.93	2.57	301.78	0.02	175.21	27.07
62	-21.67	19.21	407.20	1.26e-03	130.38	27.01
63	-5.26	3.52	68.19	-7.31e-07	173.46	94.42
64	30.50	5.92	577.74	-7.06e-04	172.09	68.02
65	4.02	3.69	19.51	5.52e-06	165.80	9.58
66	13.00	3.23	63.28	-3.66e-06	192.03	41.83
67	0.37	4.92	267.65	-1.86e-03	218.09	13.77
68	68.62	2.82	99.58	1.78e-07	171.66	82.51
69	-57.73	0.21	97.67	-2.44e-06	180.87	53.83
70	-16.33	5.24e-13	5.57	1.43e-04	222.49	39.62
71	-51.51	6.96	255.47	1.89e-04	243.03	12.82
72	-9.65	1.93	159.59	-1.87e-04	172.64	13.51
73	39.68	4.95e-13	5.84	-1.30e-04	187.72	13.53
74	108.61	2.92e-12	5.64	1.97e-05	228.73	52.28
75	-35.37	2.23	124.78	-0.01	197.75	65.71
76	16.42	0.17	67.79	0	215.05	42.27
77	-7.75	5.02e-05	21.30	-7.12e-06	170.74	67.06
78	-6.72	1.05	143.39	-0.01	193.20	10.64
79	-8.32	1.57	87.98	-3.91e-05	189.85	47.51
80	-34.72	0.36	30.17	-1.06e-05	218.84	42.92
81	-17.41	1.70	88.74	0	181.69	40.98
82	5.52	9.00	335.96	1.61e-03	150.92	54.40
83	-8.84	0.70	67.19	-2.00e-03	193.32	14.10
84	-32.59	7.40	263.25	2.59e-03	138.29	21.20
85	3.34	4.26e-03	35.75	1.25e-03	238.18	10.75
86	-80.53	6.48	306.66	-9.33e-06	139.59	53.27
87	48.58	1.84e-12	5.78	4.83e-03	185.10	64.49
88	7.52	1.20	24.56	1.32e-05	232.38	10.44
89	-2.97	4.22	46.93	2.32e-04	224.74	60.27
90	20.92	13.18	911.44	-0.01	159.74	45.43
91	35.92	11.38	263.91	1.65e-03	154.36	72.04
92	24.27	5.45	208.37	1.02e-03	232.32	48.35
93	12.55	3.95	178.40	3.75e-03	193.29	14.43
94	-63.01	10.65	167.22	-0.02	200.59	57.68
95	50.67	1.56e-12	7.81	-0.02	188.01	63.61
96	-91.20	3.28e-04	43.03	1.18e-03	270.31	59.89
97	-22.12	7.21e-13	7.64	4.50e-03	176.87	22.88
98	-18.83	6.88e-13	7.69	1.74e-04	225.72	23.55
99	46.98	1.73e-05	48.25	-8.21e-04	250.01	47.40
100	37.92	1.90	113.15	-0.01	191.76	76.95

Table 8   **Numerical results for MPCC with** $\{n = 20, l = 30, m = 160, p = 150\}$

	Relaxation method			Direct method		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
101	-20.93	1.44	355.02	0.07	325.62	222.68
102	84.63	2.41	435.86	-2.71e-04	354.36	162.70
103	-63.89	3.95e-05	96.02	-1.70e-06	361.92	215.61
104	-57.71	3.90	766.73	0.01	337.14	174.71
105	-35.91	3.93	329.24	0.01	319.97	47.91
106	18.52	1.74e-12	20.15	4.76e-04	341.99	428.19
107	10.18	2.79e-12	19.73	2.29e-04	306.89	46.76
108	23.12	4.67	693.97	2.90e-03	369.30	300.30
109	-77.68	1.72e-05	71.59	-1.27e-03	342.98	237.14
110	-31.09	0.35	155.79	5.24e-06	329.61	197.25
111	-19.36	8.00	1454.45	5.13e-05	336.81	281.87
112	3.13	0.05	166.83	0	325.08	179.06
113	84.09	7.41	1144.35	0	313.81	169.51
114	-7.82	1.59	485.20	-5.08e-06	345.70	44.60
115	-50.77	7.15	555.12	14.23	546.63	512.91
116	14.80	0.05	135.95	4.24e-03	341.95	276.98
117	29.63	4.05e-03	155.27	-1.24e-05	344.75	164.27
118	5.89	1.51	139.05	-2.16e-03	333.02	261.15
119	1.27	6.95	584.60	1.08e-04	412.34	43.39
120	-7.17	8.07e-05	176.03	3.62e-03	384.17	458.63
121	24.07	2.43	1070.29	0	380.90	193.17
122	21.26	0.51	657.12	7.19e-04	347.65	45.37
123	-88.30	25.66	1634.27	-0.01	309.80	323.06
124	-73.86	3.86	215.17	2.92e-04	356.74	273.72
125	1.73	7.50	1316.65	0.04	339.14	333.52
126	-80.87	1.13	1280.60	0.01	304.88	65.55
127	-29.29	6.98	1047.65	-3.30e-05	333.36	118.15
128	11.45	3.77e-12	20.60	1.20e-06	306.27	116.50
129	-21.22	0.06	192.14	3.82e-03	368.74	49.59
130	-19.04	1.42	74.83	-4.71e-04	323.20	156.66
131	-61.99	7.19e-05	62.59	-0.01	351.95	171.91
132	12.15	2.70	721.09	4.64e-05	368.27	329.64
133	-52.30	8.35e-05	73.94	-1.88e-07	336.38	203.99
134	-30.14	1.67e-05	120.51	1.74e-03	400.87	226.12
135	24.12	1.88e-12	20.61	2.28e-05	292.95	260.82
136	-114.79	0.49	68.12	-2.44e-05	358.11	124.97
137	-49.11	1.28	91.22	6.43e-05	287.78	264.25
138	21.30	19.38	662.95	0	344.91	171.11
139	27.14	8.58	329.95	-1.68e-03	349.41	410.16
140	-75.68	3.82	214.64	0.03	355.12	257.42
141	-5.79	0.60	142.52	0	363.33	200.94
142	-41.38	3.01	1349.33	1.32e-04	388.18	155.38
143	-41.45	2.12	708.14	9.13e-05	386.47	41.88
144	-4.43	1.61e-12	20.26	-1.09e-05	365.58	137.57
145	3.37	0.76	266.00	-2.53e-05	352.11	231.63
146	-53.92	0.22	229.22	-1.68e-03	267.22	34.20
147	-57.19	0.18	381.74	4.47e-05	318.16	149.95
148	-25.96	1.95e-05	74.59	1.92e-05	382.96	225.86
149	-10.55	2.10	737.30	-4.52e-04	362.85	329.32
150	14.18	2.91e-12	20.51	-4.15e-04	364.48	162.55

Table 9   **Numerical results for WDP with** $\{n = 20, l = 30, m = 60, p = 50\}$

	Relaxation method			Direct method		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
1	4.06	1.84	85.42	3.92e-03	114.20	19.16
2	6.55	0.26	19.25	0.04	130.52	7.26
3	-35.61	10.18	111.47	0.04	135.95	6.25
4	23.20	10.93	66.11	0.09	138.84	17.60
5	13.44	0.33	9.43	3.39e-03	148.46	4.10
6	11.24	4.74	52.85	-0.02	154.22	18.87
7	-14.72	1.98	36.89	-6.44e-04	112.77	5.60
8	-8.03	2.87	89.26	0.03	165.95	6.56
9	-26.38	3.95e-05	10.21	0.09	112.67	7.81
10	-48.01	6.40	69.77	0.02	119.38	8.20
11	-24.08	1.09e-13	1.97	-0.07	127.57	5.73
12	-14.25	0.14	9.74	1.03e-03	125.18	4.76
13	9.45	4.08e-04	5.47	0.10	128.63	5.68
14	-29.89	27.04	78.82	0.18	172.56	2.88
15	8.28	8.07	74.37	4.97e-03	150.16	3.38
16	-7.46	7.10e-14	2.20	0.06	142.54	3.02
17	-23.81	0.28	39.34	0.03	150.19	3.35
18	-9.76	0.57	42.99	0.15	130.29	5.64
19	6.62	18.70	97.43	-0.32	149.15	7.38
20	3.41	15.69	121.43	-0.51	151.37	14.94
21	-11.89	18.28	80.03	-0.15	171.47	5.60
22	37.59	1.75e-04	8.40	-0.08	138.37	6.20
23	16.81	3.20	83.57	0.02	134.04	3.10
24	-56.69	15.57	73.81	0.07	113.74	4.77
25	-1.09	6.39e-05	10.56	0.01	152.02	5.30
26	7.84	2.13	15.06	-0.14	124.00	8.27
27	-45.40	7.87	17.68	0.03	171.98	4.58
28	-68.29	0.71	52.54	0.01	165.20	6.46
29	-18.91	5.17	12.49	-0.07	122.34	4.63
30	3.33	0.01	11.27	-0.10	156.24	10.50
31	11.94	5.45e-14	1.93	0.08	160.73	7.05
32	-9.89	36.23	122.38	-2.79e-03	132.79	10.21
33	-33.29	0.22	13.92	1.56e-03	137.50	4.31
34	-40.45	5.18	157.91	-0.07	127.19	4.59
35	19.08	1.51	7.60	-0.03	137.58	4.57
36	13.17	1.91	43.27	0.01	131.92	6.12
37	38.03	3.71	110.56	0.02	125.92	6.24
38	-1.46	0.03	19.51	-0.01	172.44	3.89
39	-25.83	2.03	42.36	-0.02	142.46	11.06
40	-28.14	0.94	25.60	-4.46e-04	142.46	11.20
41	3.21	16.23	146.01	0.04	110.16	4.31
42	19.30	0.04	46.02	0.13	162.51	4.60
43	-11.89	28.09	68.68	-0.08	178.40	6.62
44	14.04	11.57	90.30	-0.01	81.76	5.83
45	46.91	31.22	60.61	0.15	142.96	3.29
46	2.30	17.97	90.31	-0.01	141.53	8.05
47	-30.06	17.39	122.25	-6.89e-04	136.46	4.65
48	-0.80	1.35e-13	2.47	-0.04	110.59	2.89
49	3.36	0.73	36.93	-0.35	131.52	4.87
50	28.81	4.48	107.48	0.07	136.97	5.53

Table 10   **Numerical results for WDP with** $\{n = 20, l = 30, m = 100, p = 110\}$

	Relaxation method			Direct method		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
51	-54.73	6.09	267.81	-0.14	182.38	15.87
52	-3.66	4.64	126.34	0.11	206.01	9.35
53	57.71	1.23e-04	30.09	0	182.11	29.21
54	-25.78	10.66	126.68	-0.04	198.35	28.74
55	-38.89	4.89e-03	67.78	0.11	233.39	12.82
56	27.11	6.05	371.82	0.10	199.59	36.39
57	10.55	6.20	262.44	-0.16	266.66	13.43
58	38.93	15.82	156.19	0.06	206.92	18.77
59	2.83	4.85e-13	7.88	0.06	225.38	8.53
60	27.17	0.05	36.34	0.05	163.58	71.49
61	-14.13	4.28	352.88	0.09	175.35	36.70
62	-46.38	2.28	47.03	0.04	130.33	8.44
63	4.61	0.96	93.68	-0.07	173.63	47.88
64	4.85	8.90	412.58	0.10	172.35	24.45
65	-32.09	2.04	63.03	-6.23e-04	165.80	16.56
66	1.63	2.00	82.09	-0.14	192.19	23.75
67	4.08	5.78	65.70	0.03	218.17	16.09
68	-0.79	14.28	150.06	0.03	171.71	24.35
69	12.31	19.63	187.77	2.97e-03	180.87	14.34
70	-16.33	5.24e-13	9.74	0.01	222.48	27.35
71	-45.36	9.17e-13	9.31	0.06	243.17	79.95
72	11.63	6.66e-05	27.76	-2.02e-03	172.64	49.81
73	-22.35	4.22e-04	29.93	0.01	187.75	25.33
74	20.15	3.26e-06	21.78	0.02	228.69	19.04
75	-60.36	1.11	62.36	-0.01	197.76	25.39
76	25.43	0.13	85.20	-4.56e-03	215.05	48.39
77	37.94	1.57	71.95	0.27	170.73	8.93
78	22.68	0.67	201.25	0.22	193.62	11.08
79	-46.14	18.47	305.27	0.03	190.19	64.79
80	-34.55	1.06e-05	30.95	0.15	219.48	16.19
81	-39.80	6.58e-13	8.20	0.01	181.69	10.27
82	-20.24	2.41	81.49	-0.11	150.93	34.13
83	18.54	2.75e-09	19.73	2.11e-03	193.22	11.91
84	-38.75	0.46	143.76	0.07	138.25	18.34
85	-7.95	3.76	404.61	0.06	238.03	32.28
86	-9.53	2.51e-04	28.96	0.01	139.63	13.73
87	48.58	1.84e-12	8.74	0.04	185.23	20.24
88	-15.41	7.02	236.65	-0.01	232.74	116.77
89	-13.90	6.41	298.68	0.10	224.60	15.24
90	0.32	2.89e-04	35.08	0.06	159.71	16.21
91	58.71	3.68e-05	29.59	0.02	154.54	8.37
92	-20.78	6.75e-13	8.67	-0.02	232.43	40.57
93	-56.86	4.10	63.68	0.09	193.13	13.05
94	5.47	1.62	63.82	0.02	200.98	8.52
95	50.67	1.56e-12	9.43	3.97e-05	188.77	12.94
96	15.67	7.77	63.08	0.06	270.26	20.77
97	45.39	0.08	28.54	-0.06	176.99	24.00
98	-18.83	6.88e-13	8.02	-4.49e-03	225.88	57.99
99	-34.51	3.21	72.09	0.03	249.93	12.04
100	0.16	1.50e-12	7.73	-0.03	191.84	8.54

Table 11   Numerical results for WDP with $\{n = 20, l = 30, m = 160, p = 150\}$

#	Relaxation method			Direct method		
	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
101	-65.19	2.11	909.73	-0.03	325.65	35.67
102	-67.83	1.30	389.57	-0.07	354.33	45.60
103	23.00	4.70	1487.03	-0.01	361.92	52.07
104	-3.05	16.86	1646.00	3.40e-03	337.09	29.73
105	72.06	1.55	353.81	0.02	319.93	28.44
106	18.52	1.74e-12	35.66	0.01	341.94	45.80
107	10.18	2.79e-12	36.72	-2.44e-04	306.89	38.09
108	-1.84	4.17	2558.41	-0.03	369.36	106.16
109	52.53	1.21e-05	217.45	-0.07	342.95	74.85
110	-35.50	1.26e-12	35.34	-2.05e-03	329.61	45.99
111	26.82	0.87	1018.81	-0.01	336.84	64.80
112	-65.13	3.34e-04	322.92	6.80e-04	325.08	41.25
113	106.61	2.52	961.21	0	313.81	119.08
114	-71.72	6.09	525.53	0.15	345.93	42.39
115	-22.85	2.38	1908.27	0.07	353.17	31.07
116	-1.37	10.00	1223.43	0.01	342.06	381.76
117	33.04	0.61	288.43	4.31e-03	344.77	74.69
118	3.25	0.27	207.87	0.03	333.06	66.19
119	-16.43	33.76	956.61	-0.18	412.36	215.31
120	50.42	9.77	1061.18	-0.09	384.13	102.87
121	37.90	1.12e-12	34.43	2.69e-03	380.89	72.81
122	39.22	6.00	2889.76	0.06	347.61	48.15
123	-36.95	2.47	932.33	0.03	309.83	67.20
124	19.60	3.08	787.65	0.02	356.81	121.19
125	46.75	0.81	164.42	0.10	339.26	38.92
126	36.14	0.56	123.95	-0.11	305.40	250.93
127	-65.22	1.87	437.49	-0.02	333.40	51.16
128	11.45	3.77e-12	34.24	0.03	306.35	192.47
129	-3.58	63.53	3315.61	-0.02	368.69	71.48
130	-1.44	2.69	775.65	-0.01	323.20	83.25
131	-84.45	4.13e-12	34.90	0.02	352.13	45.82
132	42.70	0.10	130.79	-1.35e-05	368.27	139.33
133	-13.42	4.77	543.88	2.75e-03	336.38	465.30
134	-65.58	2.00	682.34	0.03	400.91	35.73
135	-106.20	1.27	310.63	0.03	292.91	127.64
136	-12.21	2.02	354.12	-0.03	358.16	39.09
137	-9.05	7.96	361.39	0.02	287.74	71.90
138	-16.70	2.26e-12	34.86	-0.02	344.95	220.47
139	-8.53	5.16	156.37	0.08	349.46	466.56
140	18.19	1.86e-04	158.24	0.02	355.32	75.25
141	-49.57	8.30e-10	80.38	3.67e-05	363.33	40.47
142	-26.95	0.47	669.55	5.64e-04	388.35	45.41
143	31.40	2.55	1297.74	-0.05	386.55	78.13
144	-4.43	1.61e-12	37.38	-0.01	365.54	53.27
145	-47.28	0.04	320.02	-0.01	352.15	98.04
146	15.52	1.25e-12	37.01	-0.08	267.19	38.55
147	79.89	7.04	929.20	-0.07	318.36	104.64
148	-35.87	3.48e-12	35.96	3.53e-03	382.99	39.39
149	63.80	1.13e-12	36.73	0.29	363.14	67.30
150	14.18	2.91e-12	40.48	-0.02	364.59	91.02

Table 12 **Numerical results for MDP with** $\{n = 20, l = 30, m = 60, p = 50\}$

	Relaxation method			Direct method		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
1	3.21	5.24	47.29	2.68e-03	114.22	4.62
2	-16.50	0.96	18.81	0.04	130.51	7.67
3	-54.60	2.16e-04	4.87	0.06	135.94	6.33
4	-28.70	1.01e-08	2.90	0.09	138.90	11.58
5	-1.80	7.03e-13	1.95	1.02e-03	148.46	4.16
6	10.86	1.66	10.28	3.85e-03	154.24	9.14
7	20.52	2.93	55.89	-1.65e-03	112.77	4.52
8	17.32	1.78	9.22	0.02	165.86	6.70
9	8.87	1.20e-08	2.84	0.01	112.67	5.73
10	4.16	7.04	12.78	0.02	119.39	7.27
11	-7.55	5.07	64.81	-0.07	127.58	4.18
12	-0.95	6.01e-14	2.08	1.01e-03	125.18	8.17
13	0.16	3.28e-04	11.21	0.05	128.70	6.21
14	0.37	7.93e-14	1.99	0.17	172.56	2.87
15	-24.56	8.37e-09	2.97	4.68e-03	150.16	12.95
16	0.44	0.02	17.47	0.06	142.55	2.91
17	46.60	0.06	13.44	0.03	150.17	3.07
18	-4.96	4.15	31.46	0.29	130.29	9.08
19	-23.60	1.13e-08	2.88	-0.50	149.13	4.65
20	-34.03	0.05	7.79	-0.21	151.33	4.43
21	-9.90	1.25e-13	2.00	-0.01	171.57	2.79
22	-33.63	1.99	56.55	0.20	138.38	5.46
23	-43.99	0.65	29.05	0.10	134.03	3.95
24	23.21	8.23e-09	2.85	0.06	113.72	4.64
25	23.64	12.48	33.59	0.01	152.02	5.75
26	-6.84	3.65	49.61	-0.14	124.00	7.70
27	23.22	1.39e-13	1.91	0.03	171.99	6.18
28	-8.58	0.76	13.46	0.01	165.19	6.53
29	-5.64	9.02	39.18	-0.06	122.37	3.95
30	22.74	2.65	34.99	-0.01	156.28	12.34
31	11.94	5.45e-14	1.94	0.07	160.71	6.25
32	3.94	5.74e-04	8.29	-2.91e-03	132.79	10.61
33	-4.91	0.10	6.13	1.35e-03	137.50	4.23
34	6.90	2.31	26.87	-0.06	127.18	4.49
35	-24.57	2.66e-05	6.94	-0.03	137.57	4.42
36	3.07	1.27	29.22	-0.05	131.92	7.33
37	18.04	9.67e-09	2.87	0.04	125.90	8.56
38	-15.59	0.11	17.70	-0.02	172.45	5.72
39	-4.57	0.01	9.07	-0.03	142.48	6.98
40	-10.19	14.30	25.58	-5.49e-04	142.46	12.07
41	10.59	2.72e-04	7.46	0.04	110.16	4.43
42	27.97	0.01	8.14	0.32	162.52	2.80
43	-47.87	4.13	12.66	0.04	178.43	10.40
44	-30.98	0.25	36.20	-0.01	81.84	4.48
45	-15.85	8.38	11.80	0.20	142.95	2.87
46	22.06	27.90	23.05	-0.01	141.53	7.58
47	-4.14	3.50	22.23	-4.78e-04	136.46	5.27
48	-0.80	1.35e-13	2.12	-0.02	110.55	4.75
49	-42.24	2.53	18.88	-0.33	131.43	6.34
50	-10.46	7.50	22.08	0.06	136.96	6.80

Table 13   **Numerical results for MDP with** $\{n=20, l=30, m=100, p=110\}$

	Relaxation method			Direct method		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
51	-55.75	8.55e-13	13.41	-0.12	182.38	14.54
52	-22.64	2.36e-05	41.38	0.10	206.02	71.53
53	-42.35	2.12	146.52	0	182.11	27.58
54	30.74	2.11	156.74	-0.05	198.35	26.76
55	-5.64	7.84e-13	8.48	0.11	233.39	13.49
56	-10.26	2.60	257.67	0.04	199.57	17.08
57	-15.79	2.97e-13	10.22	-0.18	266.65	12.81
58	28.41	0.67	62.93	0.04	206.82	18.18
59	12.36	7.01	84.31	0.06	225.38	80.50
60	10.50	2.24	132.66	-4.89e-03	163.61	39.65
61	-0.51	0.80	43.19	-0.10	175.35	91.61
62	-6.40	1.85	266.01	-0.06	130.34	16.79
63	-0.98	1.43	22.58	-0.07	173.61	8.50
64	-21.77	12.29	438.93	-0.11	172.34	26.87
65	-33.90	4.25	210.93	7.16e-05	165.80	13.55
66	36.93	1.47	190.08	-4.50e-04	192.10	27.18
67	-43.04	3.82	112.33	0.03	218.17	18.48
68	-0.32	5.71e-09	10.08	-0.04	171.84	41.14
69	-61.54	1.19e-12	7.98	-9.35e-05	180.87	16.35
70	-4.04	4.12e-06	23.01	0.02	222.49	24.92
71	-45.36	9.17e-13	8.41	-0.11	243.15	28.96
72	18.60	5.33e-05	26.53	-2.48e-03	172.64	82.68
73	-32.39	3.94e-06	49.07	0.01	187.75	25.39
74	108.61	2.92e-12	8.53	-0.10	228.82	15.51
75	-19.06	4.30	136.13	1.50e-03	197.76	22.74
76	-83.10	0.62	73.30	-4.19e-03	215.05	28.70
77	-14.80	3.49	25.35	0.27	170.78	9.51
78	11.90	19.69	253.52	0.25	193.63	13.68
79	-3.06	8.65e-09	10.67	-0.07	190.14	16.69
80	33.69	0.02	43.53	0.14	219.48	13.84
81	-39.80	6.58e-13	8.22	0.01	181.69	12.33
82	7.82	1.17	42.89	-0.11	150.90	23.27
83	18.02	7.54	109.11	4.67e-03	193.22	10.24
84	28.87	2.19	75.76	0.07	138.25	12.48
85	23.21	1.46	79.76	0.03	238.18	88.78
86	26.82	0.11	53.31	0.02	139.63	12.52
87	15.08	9.06e-05	20.32	0.04	185.22	89.37
88	-22.40	0.30	56.49	0.14	234.63	8.77
89	31.95	0.57	55.24	0.11	224.64	46.52
90	-6.59	4.08	150.14	-2.88e-03	159.70	21.77
91	-46.51	1.17	91.73	0.02	154.53	8.19
92	-20.78	6.75e-13	7.91	-0.04	232.39	54.09
93	14.06	1.53	9.94	0.09	193.14	12.25
94	-23.32	3.61	44.46	0.02	200.98	10.02
95	50.67	1.56e-12	8.40	0.04	188.80	12.20
96	14.80	6.85	121.42	-0.05	270.25	14.34
97	-22.12	7.21e-13	8.10	-0.06	176.98	24.42
98	40.25	2.01	108.25	-0.04	225.90	23.18
99	-56.85	1.08e-05	81.21	0.01	249.91	12.16
100	0.16	1.50e-12	7.99	-0.01	191.83	8.10

Table 14 **Numerical results for MDP with** $\{n = 20, l = 30, m = 160, p = 150\}$

	Relaxation method			Direct method		
#	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
101	-2.82	2.89	500.21	0.02	325.65	54.09
102	34.13	8.56e-09	35.47	-0.06	354.32	44.77
103	-28.62	6.74e-04	107.01	4.21e-03	361.92	451.83
104	-22.94	2.44	792.97	0.01	337.08	331.35
105	-33.90	1.81	348.45	0.02	319.93	27.51
106	-45.69	4.17	74.42	0.01	341.95	47.16
107	10.18	2.79e-12	35.55	-2.13e-04	306.89	26.11
108	60.31	1.52	932.70	0.04	369.36	38.46
109	-58.48	5.47e-05	157.48	-0.07	342.98	100.24
110	-31.98	1.96e-04	224.44	-2.69e-05	329.61	38.02
111	-67.05	1.55	783.97	0.02	336.78	101.19
112	38.03	1.07e-04	98.76	4.89e-04	325.08	37.04
113	-9.62	8.76	1053.07	0	313.81	126.74
114	-44.63	6.87	151.64	0.16	345.93	44.66
115	-12.04	8.90	830.94	0.07	353.16	29.77
116	-66.82	4.47e-04	165.91	-0.07	342.11	250.49
117	-23.55	6.65e-05	85.48	4.06e-03	344.77	173.30
118	8.08	0.56	467.49	0.03	333.06	68.39
119	-24.36	0.22	333.40	-0.17	412.35	211.77
120	4.02	2.96e-12	31.55	-0.15	384.15	83.43
121	37.90	1.12e-12	30.38	5.66e-04	380.90	49.63
122	17.49	1.67	525.87	0.05	347.65	45.48
123	5.84	0.37	269.81	0.03	309.81	62.58
124	13.09	1.03	325.70	0.01	356.81	78.97
125	37.98	1.75	415.94	0.10	339.25	40.55
126	-47.62	9.27e-05	165.68	-0.10	305.37	47.07
127	-13.52	21.20	2939.47	-6.62e-05	333.47	356.61
128	-40.96	0.02	76.37	0.04	306.34	504.32
129	-20.79	7.84e-09	35.21	-0.06	368.73	72.91
130	-7.98	3.08	1245.48	-0.01	323.20	81.81
131	-16.26	7.04e-05	92.78	0.02	352.13	41.72
132	6.51	3.35	1414.50	-1.36e-05	368.27	141.78
133	14.16	9.11e-09	36.01	2.26e-03	336.38	446.21
134	-61.84	1.42	338.04	0.03	400.91	40.66
135	10.43	17.74	809.42	-0.02	292.92	344.98
136	-36.90	2.69	202.15	-0.04	358.15	38.80
137	-31.30	13.48	1477.92	0.04	287.76	112.62
138	-16.70	2.26e-12	30.66	-0.01	344.95	280.75
139	38.07	8.94	119.69	0.03	349.42	83.34
140	15.18	8.12e-09	38.56	0.02	355.34	85.16
141	9.05	0.61	111.08	3.52e-05	363.33	32.09
142	0.19	29.36	638.53	-0.01	388.32	48.90
143	25.93	0.72	175.92	-0.01	386.51	144.35
144	-4.43	1.61e-12	32.35	-0.01	365.54	45.14
145	60.32	6.38e-05	97.68	-2.48e-04	352.15	29.41
146	15.52	1.25e-12	32.46	-0.08	267.20	44.49
147	-26.83	36.96	500.38	0.05	318.40	83.87
148	-77.01	4.71	580.27	0.01	382.98	50.90
149	-20.24	1.98	453.02	-0.09	363.12	69.24
150	14.18	2.91e-12	30.06	0.07	364.64	130.64

Table 15   Numerical results for eMDP with $\{n = 20, l = 30, m = 60, p = 50\}$

#	Relaxation method			Direct method		
	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
1	-18.72	4.60e-13	2.26	0.12	114.19	4.71
2	-6.78	1.54	51.06	0.04	130.51	27.72
3	28.56	8.02e-09	3.33	0.09	135.91	11.05
4	-28.70	9.50e-09	3.25	-0.15	138.84	60.82
5	-1.80	7.03e-13	2.38	1.94e-03	148.46	3.86
6	23.83	0.03	158.95	0.16	154.28	4.50
7	-19.61	1.09	43.93	-1.95e-03	112.77	5.10
8	-39.25	1.49	94.12	-0.01	165.82	44.36
9	8.87	9.37e-09	2.84	0.01	112.60	36.57
10	-34.11	1.06e-04	42.84	0.04	119.38	4.54
11	-12.21	5.15e-05	17.19	-0.14	127.76	5.58
12	-0.95	6.01e-14	2.16	-1.32e-03	125.18	6.67
13	3.38	7.41e-09	2.89	0.05	128.64	6.49
14	-53.23	6.67e-05	8.05	0.07	172.46	18.42
15	-44.83	2.05e-04	29.50	4.26e-03	150.16	18.87
16	2.34	5.94e-05	37.82	-0.04	142.54	18.83
17	-27.41	2.43e-13	2.16	0.02	150.17	2.86
18	-31.91	1.59e-13	2.15	0.03	130.27	10.23
19	-23.60	1.16e-08	2.86	-0.04	148.84	6.53
20	-15.49	1.01e-08	2.83	-0.50	151.26	32.48
21	-9.90	1.25e-13	2.14	0.08	171.33	42.86
22	16.77	0.03	22.69	0.15	138.37	3.57
23	10.81	0.03	69.73	0.12	133.90	6.55
24	-1.04	0.77	28.49	0.03	113.71	26.99
25	16.00	1.59e-08	2.93	0.03	152.02	6.15
26	-47.02	2.21	95.85	-0.01	123.99	18.87
27	-39.32	1.03e-04	15.46	0.04	171.98	8.13
28	-26.67	1.13e-08	3.01	0.03	165.20	5.07
29	6.94	1.61e-04	62.96	-0.07	122.03	24.55
30	-13.26	0.01	23.86	0.26	156.38	23.40
31	11.94	5.45e-14	2.41	0.08	160.73	19.90
32	-43.71	1.48e-13	2.23	-2.89e-03	132.79	13.09
33	12.95	2.48e-04	64.08	1.18e-03	137.50	27.18
34	-30.81	0.01	97.05	0.03	127.20	18.40
35	-6.41	0.42	114.50	0.11	137.52	42.00
36	-50.76	2.12e-04	17.77	-0.09	131.92	6.06
37	32.21	2.07e-04	7.31	0.01	125.93	20.84
38	24.18	2.09e-13	2.20	0.04	172.45	39.91
39	34.86	1.67e-08	3.03	-0.03	142.37	37.98
40	35.52	3.44e-05	7.75	4.12e-05	142.46	45.59
41	27.53	8.52e-09	2.94	0.02	110.15	17.08
42	-4.76	1.85e-04	37.50	0.26	162.49	2.96
43	14.15	0.49	70.04	0.01	178.45	11.47
44	-33.87	5.79e-05	8.50	-0.01	81.82	15.33
45	9.14	4.66e-04	27.10	0.20	142.88	11.03
46	-10.22	1.23e-05	24.53	-0.02	141.53	11.04
47	-4.36	9.34e-09	2.91	1.07e-03	136.46	19.86
48	-0.80	1.35e-13	3.47	-0.05	110.56	18.06
49	-32.63	3.80e-04	34.40	-0.25	131.46	6.22
50	-9.05	1.14e-04	12.93	-0.06	136.95	55.12

Table 16   **Numerical results for eMDP with** $\{n = 20, l = 30, m = 100, p = 110\}$

#	Relaxation method			Direct method		
	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
51	-43.66	1.02e-08	12.88	0.06	182.65	212.89
52	-17.97	4.68e-13	10.82	0.05	205.92	236.19
53	-43.21	1.07e-12	11.24	0	182.11	48.04
54	40.13	1.07e-08	13.08	-0.05	198.35	35.85
55	38.10	3.39e-05	514.86	-0.09	233.88	420.26
56	-5.86	5.99e-13	10.23	-0.03	199.57	56.23
57	-30.80	6.77e-06	137.03	0.05	266.60	200.69
58	99.43	8.44e-09	11.95	-0.06	206.87	225.52
59	2.83	4.85e-13	10.58	-0.01	225.36	259.70
60	-41.48	6.70e-09	12.31	0.01	163.59	152.78
61	-5.08	0.08	296.11	-0.03	175.30	391.29
62	13.70	4.86e-09	12.13	-0.03	130.34	110.99
63	-9.30	9.11e-09	12.63	-0.07	173.58	24.03
64	49.28	2.70e-03	201.82	-0.05	172.27	526.85
65	-21.52	8.08e-05	137.61	9.75e-05	165.80	13.07
66	0.27	5.72e-04	297.26	-0.01	192.10	247.53
67	41.77	6.80e-13	10.61	-0.01	218.16	189.43
68	-0.32	5.81e-09	12.06	0.02	171.71	135.73
69	-61.54	1.19e-12	11.19	2.84e-04	180.87	179.53
70	4.43	8.31e-05	30.29	0.04	222.47	360.41
71	-45.36	9.17e-13	10.27	-0.01	243.12	193.92
72	14.17	9.59e-05	168.25	-4.82e-03	172.64	144.96
73	46.28	1.07e-04	304.09	5.47e-04	187.74	124.65
74	108.61	2.92e-12	16.17	-0.12	228.86	345.25
75	-25.17	6.70e-13	14.94	0.02	197.76	144.97
76	-20.11	8.33e-13	14.71	-0.01	215.05	23.70
77	19.19	5.25e-09	17.34	0.26	170.79	12.93
78	-31.74	9.86e-09	16.94	0.24	193.64	92.25
79	29.04	6.20e-05	370.42	-0.07	190.07	100.72
80	13.66	2.17e-05	253.11	0.11	219.01	447.82
81	1.98	1.24e-04	54.15	0.01	181.69	17.81
82	-16.12	0.18	260.24	-0.12	150.89	103.12
83	-59.33	8.44e-09	16.59	-0.03	193.24	24.39
84	3.76	1.82e-12	14.25	0.05	138.23	163.39
85	4.28	2.04e-13	14.18	-0.02	238.14	327.32
86	25.62	6.67e-09	16.62	0.09	139.93	123.22
87	48.58	1.84e-12	14.80	0.02	185.19	121.84
88	-43.05	1.19	338.85	0.08	233.67	125.49
89	-7.72	7.23e-09	16.20	-0.14	224.61	95.27
90	54.37	8.17e-05	772.39	-0.01	159.72	229.14
91	6.11	6.95e-09	11.56	-0.04	154.55	88.28
92	-20.78	6.75e-13	10.25	-0.05	232.43	96.10
93	14.06	1.53	11.90	-0.03	193.15	314.94
94	27.02	7.81e-05	142.91	0.04	200.89	120.99
95	50.67	1.56e-12	11.07	0.10	188.36	220.19
96	-17.34	1.30e-04	238.72	0.04	270.27	119.62
97	-22.12	7.21e-13	14.53	2.75e-03	176.95	76.03
98	-18.83	6.88e-13	14.44	0.10	225.84	289.19
99	7.47	3.20	537.11	0.05	249.89	374.74
100	0.16	1.50e-12	14.27	-0.02	191.82	97.58

Table 17 **Numerical results for eMDP with** $\{n = 20, l = 30, m = 160, p = 150\}$

#	Relaxation method			Direct method		
	ObjVal	Infeasibility	Time	ObjVal	Infeasibility	Time
101	-23.26	1.03e-08	46.34	-0.03	325.65	758.89
102	34.13	7.17e-09	43.42	-0.05	354.33	898.23
103	4.56	1.71e-12	38.53	0.01	361.89	1416.60
104	-5.69	1.06e-08	42.54	0.03	337.10	855.68
105	37.74	1.06e-08	42.28	0.02	319.92	1041.51
106	18.52	1.74e-12	39.48	-0.02	341.90	1813.56
107	10.18	2.79e-12	39.38	-2.14e-04	306.89	323.45
108	-27.93	1.51e-08	47.77	0.03	369.34	93.50
109	-24.75	1.14e-08	59.54	-0.02	342.98	2277.21
110	-35.50	1.26e-12	39.73	-2.83e-04	329.61	96.88
111	41.75	1.06e-08	43.79	0.01	336.81	414.92
112	-2.59	8.25e-05	666.57	3.67e-04	325.08	95.50
113	19.43	9.07e-09	45.50	0	313.81	336.25
114	-41.47	8.49e-09	44.10	0.13	345.88	1680.14
115	54.34	2.77e-12	43.84	0.04	353.09	835.64
116	-50.06	1.71e-12	42.10	0.03	342.12	1734.09
117	14.64	9.16e-09	45.28	0.02	344.76	1357.36
118	-20.21	7.64e-09	44.63	0.02	333.05	1315.85
119	47.99	1.27e-12	41.43	-0.09	412.32	83.60
120	4.02	2.96e-12	41.05	-0.07	384.04	1700.28
121	37.90	1.12e-12	39.94	0.07	380.91	106.68
122	24.51	1.01e-08	45.57	-0.12	347.67	1356.86
123	37.76	6.33e-09	44.65	0.05	309.82	57.64
124	-30.36	1.17e-08	45.98	0.03	356.79	653.57
125	-12.21	0.02	1316.58	0.00	339.24	2908.56
126	30.29	2.43e-12	40.99	-0.39	305.28	46.99
127	12.33	1.80	43.95	-3.71e-03	333.37	1110.54
128	11.45	3.77e-12	44.43	-0.10	306.48	1842.64
129	57.29	0.05	293.94	-0.02	368.70	1708.29
130	4.08	1.44e-12	44.81	0.01	323.19	2880.46
131	-84.45	4.13e-12	42.30	0.02	352.11	688.16
132	-19.03	4.03e-05	604.62	-1.11e-05	368.27	96.14
133	14.16	8.82e-09	43.90	-1.27e-03	336.38	1166.89
134	-36.19	1.75e-08	45.46	0.13	401.50	95.81
135	24.12	1.88e-12	39.44	-0.01	292.94	2056.53
136	-28.55	1.23e-08	44.22	0.00	358.15	1399.75
137	24.48	8.24e-09	44.63	0.11	287.76	852.14
138	-16.70	2.26e-12	40.49	0.01	344.92	60.78
139	9.15	1.50e-08	46.63	-0.11	349.68	1887.79
140	-15.21	0.37	270.20	0.03	355.31	89.45
141	-9.10	8.90e-09	44.19	4.23e-05	363.33	60.72
142	-31.80	9.34e-05	233.17	0.01	388.20	771.66
143	47.61	1.47e-08	44.22	-2.23e-03	386.49	577.68
144	-4.43	1.61e-12	38.65	0.02	365.54	703.18
145	-78.90	1.24e-04	529.64	-4.70e-03	352.16	463.83
146	37.61	5.91e-05	146.51	-0.04	267.20	1269.30
147	-42.39	9.12e-09	44.02	0.07	318.35	955.90
148	-35.87	3.48e-12	42.52	8.20e-04	382.99	55.43
149	63.80	1.13e-12	39.55	0.03	362.95	3261.49
150	14.18	2.91e-12	38.93	-0.01	364.76	1685.32