

INF273 - Meta-Heuristics

		Call_7_Vehicle_3		
	Ave. objective	Best objective	Imp (%)	Runtime
Blind Random search	204624	2046241	37.737 %	0.0099 s
Local search	162506	1625064	50.552 %	0.0142 s
Simulated annealing	217927	2179277	33.688 %	0.0091 s
Simulated annealing (new)	147742	1477429	55.044 %	0.0094 s
GAMHF	147742	1477429	55.044 %	0.5015 s

Best solution Blind Random search: [7, 7, 1, 1, 0, 0, 6, 6, 0, 5, 3, 4, 2, 3, 2, 5, 4]

Best solution Local search: [3, 3, 0, 7, 1, 7, 1, 0, 2, 2, 6, 6, 0, 4, 4, 5, 5]

Best solution Simulated annealing: [1, 1, 0, 0, 4, 7, 7, 4, 3, 3, 0, 5, 6, 5, 2, 6, 2]

Best solution Simulated annealing (new): [1, 1, 0, 7, 7, 3, 3, 0, 5, 5, 6, 6, 0, 2, 2, 4, 4]

Best solution GAMHF: [1, 1, 0, 7, 7, 3, 3, 0, 5, 5, 6, 6, 0, 4, 2, 4, 2]

		Call_18_Vehicle_5		
	Ave. objective	Best objective	Imp (%)	Runtime
Blind Random search	741123	7411230	15.411 %	0.0053 s
Local search	360884	3608844	58.81 %	0.0062 s
Simulated annealing	302046	3020466	65.526 %	0.0074 s
Simulated annealing (new)	293780	2937803	66.469 %	0.0106 s
GAMHF	314788	3147882	64.071 %	2.0139 s

Best solution Blind Random search: [10, 10, 0, 1, 1, 0, 0, 2, 2, 0, 18, 18, 0, 14, 12, 7, 6, 15, 9, 14, 17, 5, 17, 8, 16, 13, 15, 3, 7, 8, 3, 5, 6, 11, 11, 16, 4, 12, 9, 4, 13]

Best solution Local search: [18, 6, 1, 6, 1, 18, 9, 9, 0, 13, 17, 13, 8, 7, 8, 7, 17, 0, 5, 11, 5, 10, 11, 10, 3, 3, 0, 2, 2, 0, 12, 14, 12, 14, 0, 4, 4, 15, 15, 16, 16]

Best solution Simulated annealing: [12, 4, 12, 4, 9, 9, 0, 13, 11, 13, 11, 10, 7, 10, 3, 7, 3, 0, 18, 6, 17, 17, 6, 18, 0, 14, 8, 14, 8, 0, 5, 1, 5, 1, 2, 2, 0, 16, 16, 15, 15]

Best solution Simulated annealing (new): [6, 1, 6, 1, 0, 13, 4, 13, 14, 4, 14, 3, 3, 0, 11, 17, 17, 11, 10, 10, 9, 9, 0, 18, 5, 5, 18, 0,

12, 12, 8, 7, 8, 7, 2, 2, 0, 16, 15, 16, 15]  
Best solution GAMHF: [4, 14, 4, 14, 9, 9, 0, 18, 12, 12, 18, 0, 11,  
16, 16, 11, 10, 8, 10, 3, 8, 3, 0, 5, 1, 5, 1, 7, 7, 2, 2, 0, 6,  
6, 0, 15, 17, 13, 13, 17, 15]

Call_35_Vehicle_7				
	Ave. objective	Best objective	Imp (%)	Runtime
Blind Random search	1832217	18322178	0.0 %	0.0071 s
Local search	929838	9298388	49.251 %	0.0085 s
Simulated annealing	980677	9806774	46.476 %	0.0129 s
Simulated annealing (new)	736245	7362456	59.817 %	0.0627 s
GAMHF	922339	9223393	49.66 %	10.0657 s

Best solution Blind Random search: [0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 2, 2,  
3, 3, 4, 4, 5, 5, 6, 6, 7, 7, 8, 8, 9, 9, 10, 10, 11, 11, 12, 12,  
13, 13, 14, 14, 15, 15, 16, 16, 17, 17, 18, 18, 19, 19, 20, 20,  
21, 21, 22, 22, 23, 23, 24, 24, 25, 25, 26, 26, 27, 27, 28, 28,  
29, 29, 30, 30, 31, 31, 32, 32, 33, 33, 34, 34, 35, 35]  
Best solution Local search: [12, 18, 12, 18, 0, 22, 22, 27, 27, 0, 5,  
10, 5, 10, 9, 9, 0, 23, 23, 3, 3, 14, 2, 2, 14, 0, 19, 7, 13, 7,  
13, 30, 30, 19, 0, 8, 11, 11, 1, 26, 8, 1, 26, 0, 28, 28, 21, 21,  
29, 35, 29, 35, 0, 4, 4, 6, 6, 15, 15, 16, 16, 17, 17, 20, 20,  
24, 24, 25, 25, 31, 31, 32, 32, 33, 33, 34, 34]  
Best solution Simulated annealing: [24, 31, 24, 31, 0, 17, 17, 20, 20,  
4, 4, 0, 7, 5, 13, 5, 7, 13, 11, 1, 11, 1, 0, 21, 21, 16, 16, 14,  
2, 2, 14, 0, 3, 3, 22, 22, 33, 33, 0, 6, 18, 30, 30, 6, 18, 0,  
28, 28, 12, 12, 29, 35, 35, 29, 0, 34, 32, 19, 23, 32, 19, 9, 23,  
27, 15, 10, 25, 26, 8, 15, 25, 10, 8, 26, 27, 9, 34]  
Best solution Simulated annealing (new): [17, 17, 29, 11, 11, 29, 27,  
27, 4, 4, 0, 34, 5, 5, 34, 33, 33, 0, 7, 19, 13, 19, 7, 10, 13,  
10, 0, 25, 25, 22, 22, 2, 2, 0, 35, 30, 20, 35, 30, 20, 9, 9, 0,  
23, 23, 3, 8, 8, 3, 1, 31, 26, 26, 31, 1, 0, 28, 28, 21, 21, 18,  
18, 0, 32, 12, 15, 15, 14, 12, 16, 14, 24, 6, 24, 32, 16, 6]  
Best solution GAMHF: [24, 31, 24, 31, 0, 35, 30, 35, 30, 2, 2, 0,  
19, 5, 5, 19, 22, 22, 0, 34, 18, 34, 18, 33, 33, 0, 25, 29, 25,  
29, 10, 20, 20, 10, 9, 9, 0, 21, 3, 21, 8, 8, 3, 4, 4, 0, 13, 13,  
14, 14, 1, 1, 0, 27, 26, 6, 28, 26, 11, 17, 32, 11, 12, 16, 23,  
7, 17, 27, 6, 32, 23, 15, 28, 15, 16, 12, 7]

Call_80_Vehicle_20				
	Ave. objective	Best objective	Imp (%)	Runtime
Blind Random search	4221142	42211425	0.0 %	0.0214 s
Local search	2702492	27024922	35.977 %	0.0218 s
Simulated annealing	2779895	27798952	34.144 %	0.0244 s



15, 0, 65, 75, 65, 75, 0, 44, 44, 0, 2, 2, 4, 4, 10, 10, 13, 13,  
16, 16, 18, 18, 20, 20, 22, 22, 23, 23, 24, 24, 26, 26, 27, 55,  
27, 29, 29, 32, 32, 33, 33, 34, 34, 35, 35, 74, 36, 36, 39, 39,  
50, 52, 50, 51, 51, 74, 60, 60, 63, 21, 63, 64, 64, 66, 66, 67,  
21, 67, 68, 52, 68, 69, 69, 70, 70, 76, 76, 77, 77, 79, 79, 80,  
55, 80]

Best solution GAMHF: [27, 27, 7, 11, 7, 11, 10, 10, 0, 53, 5, 53,  
5, 0, 66, 60, 66, 12, 12, 21, 21, 60, 0, 55, 57, 55, 54, 54, 6,  
35, 35, 57, 6, 0, 34, 34, 13, 13, 78, 78, 0, 19, 38, 1, 1, 38,  
19, 0, 39, 39, 42, 41, 42, 41, 0, 72, 70, 72, 70, 0, 4, 4, 0, 61,  
61, 0, 74, 74, 30, 30, 65, 18, 65, 18, 0, 33, 33, 68, 68, 64, 64,  
0, 3, 28, 28, 3, 0, 14, 44, 14, 44, 76, 76, 0, 80, 80, 73, 73, 0,  
49, 31, 49, 31, 75, 75, 0, 46, 46, 56, 56, 0, 32, 32, 45, 8, 8,  
45, 0, 59, 23, 59, 23, 25, 25, 0, 20, 20, 37, 15, 37, 15, 0, 29,  
52, 51, 52, 51, 9, 16, 69, 16, 26, 17, 77, 50, 50, 79, 43, 9, 2,  
29, 63, 17, 43, 69, 67, 22, 67, 58, 26, 22, 24, 48, 36, 58, 63,  
36, 24, 48, 77, 47, 47, 71, 71, 62, 62, 40, 79, 2, 40]

Call_130_Vehicle_40				
	Ave. objective	Best objective	Imp (%)	Runtime
Blind Random search	7544668	75446687	0.0 %	0.0324 s
Local search	5439004	54390041	27.909 %	0.0308 s
Simulated annealing	5257950	52579507	30.309 %	0.0316 s
Simulated annealing (new)	3766531	37665311	50.077 %	0.0719 s
GAMHF	2636987	26369871	65.048 %	30.3097 s

Best solution Blind Random search: [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,  
0,  
0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 2, 2, 3, 3, 4, 4, 5, 5, 6, 6, 7, 7, 8,  
8, 9, 9, 10, 10, 11, 11, 12, 12, 13, 13, 14, 14, 15, 15, 16, 16,  
17, 17, 18, 18, 19, 19, 20, 20, 21, 21, 22, 22, 23, 23, 24, 24,  
25, 25, 26, 26, 27, 27, 28, 28, 29, 29, 30, 30, 31, 31, 32, 32,  
33, 33, 34, 34, 35, 35, 36, 36, 37, 37, 38, 38, 39, 39, 40, 40,  
41, 41, 42, 42, 43, 43, 44, 44, 45, 45, 46, 46, 47, 47, 48, 48,  
49, 49, 50, 50, 51, 51, 52, 52, 53, 53, 54, 54, 55, 55, 56, 56,  
57, 57, 58, 58, 59, 59, 60, 60, 61, 61, 62, 62, 63, 63, 64, 64,  
65, 65, 66, 66, 67, 67, 68, 68, 69, 69, 70, 70, 71, 71, 72, 72,  
73, 73, 74, 74, 75, 75, 76, 76, 77, 77, 78, 78, 79, 79, 80, 80,  
81, 81, 82, 82, 83, 83, 84, 84, 85, 85, 86, 86, 87, 87, 88, 88,  
89, 89, 90, 90, 91, 91, 92, 92, 93, 93, 94, 94, 95, 95, 96, 96,  
97, 97, 98, 98, 99, 99, 100, 100, 101, 101, 102, 102, 103, 103,  
104, 104, 105, 105, 106, 106, 107, 107, 108, 108, 109, 109, 110,  
110, 111, 111, 112, 112, 113, 113, 114, 114, 115, 115, 116, 116,  
117, 117, 118, 118, 119, 119, 120, 120, 121, 121, 122, 122, 123,

123, 124, 124, 125, 125, 126, 126, 127, 127, 128, 128, 129, 129,  
130, 130]

Best solution Local search: [91, 91, 0, 120, 120, 66, 66, 106, 106,  
0, 119, 119, 0, 90, 90, 0, 62, 62, 5, 79, 5, 79, 0, 122, 122, 35,  
35, 10, 10, 0, 58, 58, 68, 68, 0, 31, 31, 0, 117, 117, 109, 109,  
0, 100, 100, 0, 104, 104, 0, 103, 103, 0, 39, 39, 124, 124, 0,  
83, 83, 51, 51, 0, 94, 94, 0, 48, 48, 0, 41, 41, 0, 64, 64, 0,  
92, 92, 0, 111, 111, 0, 102, 102, 99, 99, 0, 112, 112, 0, 105,  
105, 86, 86, 0, 49, 49, 0, 0, 46, 46, 0, 72, 20, 20, 72, 0, 13,  
24, 13, 24, 0, 0, 81, 129, 1, 1, 129, 81, 0, 42, 42, 0, 88, 88,  
0, 123, 123, 0, 19, 36, 36, 19, 0, 63, 63, 0, 44, 44, 0, 0, 0,  
14, 14, 0, 70, 70, 0, 2, 2, 3, 3, 4, 4, 6, 6, 7, 7, 8, 8, 9, 9,  
11, 11, 12, 12, 15, 15, 16, 16, 17, 17, 18, 18, 21, 21, 22, 22,  
23, 23, 25, 25, 26, 26, 27, 27, 28, 28, 29, 29, 30, 30, 32, 32,  
33, 33, 34, 34, 37, 37, 38, 38, 40, 40, 43, 43, 45, 45, 47, 47,  
50, 50, 52, 52, 53, 53, 54, 54, 55, 55, 56, 56, 57, 57, 59, 59,  
60, 60, 61, 61, 65, 65, 67, 67, 69, 69, 71, 71, 73, 73, 74, 74,  
75, 75, 76, 76, 77, 77, 78, 78, 80, 80, 82, 82, 84, 84, 85, 85,  
87, 87, 89, 89, 93, 93, 95, 95, 96, 96, 97, 97, 98, 98, 101, 101,  
107, 107, 108, 108, 110, 110, 113, 113, 114, 114, 115, 115, 116,  
116, 118, 118, 121, 121, 125, 125, 126, 126, 127, 127, 128, 128,  
130, 130]

Best solution Simulated annealing: [64, 64, 75, 75, 0, 93, 93, 0,  
47, 47, 112, 112, 27, 27, 0, 51, 51, 0, 78, 14, 14, 78, 0, 18,  
31, 31, 18, 0, 100, 100, 0, 105, 105, 29, 24, 29, 24, 0, 22, 22,  
0, 40, 40, 113, 113, 0, 0, 106, 106, 0, 28, 28, 126, 126, 0, 61,  
38, 38, 61, 0, 122, 122, 10, 10, 0, 54, 54, 0, 103, 103, 0, 90,  
90, 0, 72, 72, 0, 1, 53, 53, 1, 0, 74, 74, 0, 21, 21, 0, 60, 44,  
44, 60, 0, 0, 85, 85, 0, 0, 80, 35, 80, 35, 0, 32, 32, 0, 62, 62,  
20, 20, 0, 0, 121, 128, 121, 128, 0, 115, 115, 0, 0, 114, 117,  
117, 114, 0, 11, 129, 11, 129, 0, 0, 73, 6, 6, 73, 0, 130, 81,  
81, 130, 0, 71, 97, 71, 97, 0, 15, 15, 0, 45, 45, 76, 76, 118,  
118, 33, 88, 33, 86, 86, 39, 125, 39, 42, 42, 43, 43, 91, 91,  
124, 124, 111, 111, 123, 123, 120, 120, 30, 30, 87, 87, 94, 94,  
116, 116, 70, 70, 12, 12, 52, 52, 95, 95, 65, 65, 26, 26, 48, 48,  
55, 55, 84, 84, 58, 58, 127, 127, 82, 82, 92, 92, 37, 37, 49, 49,  
4, 4, 8, 8, 107, 107, 41, 41, 17, 17, 108, 108, 36, 36, 5, 88, 5,  
69, 69, 99, 99, 2, 2, 77, 77, 23, 23, 57, 57, 101, 101, 68, 68,  
7, 7, 110, 110, 34, 34, 66, 66, 83, 83, 89, 89, 67, 67, 104, 104,  
59, 59, 63, 63, 96, 96, 102, 102, 19, 19, 119, 119, 25, 25, 50,  
50, 109, 109, 16, 16, 3, 3, 46, 46, 9, 9, 98, 98, 79, 79, 125,  
56, 56, 13, 13]

Best solution Simulated annealing (new): [18, 38, 18, 38, 0, 23, 23,  
0, 107, 107, 93, 93, 0, 55, 36, 55, 36, 0, 50, 50, 14, 53, 14,  
53, 0, 73, 73, 51, 51, 0, 111, 111, 54, 119, 119, 0, 52, 52,  
66, 66, 75, 75, 0, 41, 8, 8, 41, 0, 97, 97, 0, 116, 92, 92, 116,

0, 108, 102, 108, 102, 10, 10, 0, 74, 74, 0, 114, 28, 28, 114,  
 0, 37, 34, 37, 34, 0, 64, 64, 0, 42, 42, 4, 4, 0, 91, 91, 2, 2,  
 0, 65, 65, 78, 78, 70, 70, 0, 80, 80, 24, 24, 0, 84, 26, 26, 84,  
 0, 25, 25, 113, 113, 0, 76, 76, 0, 110, 110, 0, 32, 32, 99, 99,  
 0, 45, 45, 0, 7, 121, 7, 121, 0, 96, 61, 96, 61, 0, 100, 29, 81,  
 81, 29, 100, 0, 12, 12, 0, 44, 44, 46, 46, 0, 49, 49, 98, 125,  
 98, 125, 0, 87, 87, 40, 3, 40, 3, 0, 5, 106, 5, 106, 0, 85, 85,  
 0, 16, 16, 88, 88, 0, 39, 39, 19, 19, 0, 90, 59, 59, 90, 0, 123,  
 123, 0, 15, 15, 0, 1, 1, 9, 9, 11, 11, 13, 13, 17, 17, 20, 20,  
 21, 21, 22, 22, 27, 27, 63, 30, 30, 31, 31, 33, 33, 130, 35, 35,  
 43, 43, 47, 47, 48, 48, 56, 56, 57, 57, 58, 58, 60, 60, 62, 62,  
 67, 67, 68, 68, 69, 69, 71, 71, 72, 6, 72, 77, 77, 79, 79, 82,  
 82, 83, 83, 86, 86, 89, 89, 94, 94, 95, 63, 95, 101, 130, 101,  
 103, 103, 104, 104, 105, 105, 109, 109, 112, 112, 115, 115, 117,  
 117, 118, 118, 120, 120, 122, 122, 124, 124, 126, 126, 127, 127,  
 128, 6, 128, 129, 129]  
 Best solution GAMHF: [111, 112, 112, 111, 0, 84, 18, 18, 84, 22,  
 22, 0, 7, 97, 97, 7, 20, 20, 53, 53, 10, 10, 0, 91, 91, 59, 59,  
 70, 70, 0, 50, 50, 93, 93, 106, 8, 8, 106, 0, 52, 52, 5, 129,  
 129, 5, 0, 33, 33, 72, 72, 27, 27, 0, 43, 43, 13, 124, 124, 13,  
 113, 113, 0, 122, 29, 122, 29, 0, 64, 64, 92, 67, 92, 40, 67, 40,  
 0, 28, 54, 28, 54, 0, 34, 34, 4, 4, 0, 80, 80, 0, 107, 107, 117,  
 117, 119, 119, 0, 96, 41, 96, 41, 0, 108, 108, 66, 24, 66, 24, 0,  
 36, 36, 0, 90, 90, 100, 100, 0, 65, 55, 65, 55, 1, 1, 0, 26, 26,  
 31, 109, 109, 31, 0, 47, 47, 101, 101, 0, 2, 12, 12, 2, 45, 45,  
 0, 125, 125, 0, 116, 78, 14, 116, 14, 78, 46, 46, 0, 25, 25, 87,  
 87, 0, 39, 39, 110, 110, 0, 76, 76, 0, 37, 102, 89, 102, 37, 89,  
 56, 56, 0, 16, 35, 16, 35, 0, 130, 19, 130, 19, 0, 61, 6, 38, 6,  
 61, 38, 0, 32, 32, 15, 15, 0, 123, 123, 44, 44, 3, 3, 0, 58, 58,  
 114, 74, 74, 114, 0, 77, 77, 95, 95, 0, 105, 105, 88, 88, 0, 68,  
 68, 42, 42, 86, 86, 0, 73, 128, 73, 128, 0, 121, 60, 121, 98, 75,  
 98, 60, 75, 85, 85, 0, 49, 49, 11, 81, 11, 81, 99, 99, 0, 82, 62,  
 62, 115, 115, 23, 83, 23, 9, 57, 9, 79, 82, 79, 21, 21, 120, 120,  
 71, 48, 71, 17, 83, 63, 118, 118, 69, 69, 126, 126, 30, 30, 51,  
 51, 48, 63, 17, 94, 94, 127, 127, 104, 104, 57, 103, 103]