



```

80     second level: [1. 0.]
81     third level: [4. 7.] ]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 7.88     temp_best_value_gen = 7.88
86     No, maintain solution and obj[gen] = 7.88 , and the tolerance_counter = 1
87     solution chromosome =
88         first level: [ [2.3 4.17]
89         second level: [1. 0.]
90         third level: [4. 7.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 7.88     temp_best_value_gen = 7.88
95     No, maintain solution and obj[gen] = 7.88 , and the tolerance_counter = 2
96     solution chromosome =
97         first level: [ [2.3 4.17]
98         second level: [1. 0.]
99         third level: [4. 7.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 7.88     temp_best_value_gen = 7.88
104     No, maintain solution and obj[gen] = 7.88 , and the tolerance_counter = 3
105     solution chromosome =
106         first level: [ [2.3 4.17]
107         second level: [1. 0.]
108         third level: [4. 7.] ]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 7.88     temp_best_value_gen = 7.88
113     No, maintain solution and obj[gen] = 7.88 , and the tolerance_counter = 4
114     solution chromosome =
115         first level: [ [2.3 4.17]
116         second level: [1. 0.]
117         third level: [4. 7.] ]
118    The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121     obj[gen-1] = 7.88     temp_best_value_gen = 7.88
122     No, maintain solution and obj[gen] = 7.88 , and the tolerance_counter = 5
123     solution chromosome =
124         first level: [ [2.3 4.17]
125         second level: [1. 0.]
126         third level: [4. 7.] ]
127    The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130     obj[gen-1] = 7.88     temp_best_value_gen = 7.35
131     Yes, update solution and obj[gen] = 7.35
132     solution chromosome =
133         first level: [ [2.11 4.17]
134         second level: [1. 0.]
135         third level: [4. 7.] ]
136    The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139     obj[gen-1] = 7.35     temp_best_value_gen = 7.35
140     No, maintain solution and obj[gen] = 7.35 , and the tolerance_counter = 1
141     solution chromosome =
142         first level: [ [2.11 4.17]
143         second level: [1. 0.]
144         third level: [4. 7.] ]
145    The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148     obj[gen-1] = 7.35     temp_best_value_gen = 7.35
149     No, maintain solution and obj[gen] = 7.35 , and the tolerance_counter = 2
150     solution chromosome =
151         first level: [ [2.11 4.17]
152         second level: [1. 0.]
153         third level: [4. 7.] ]
154    The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157     obj[gen-1] = 7.35     temp_best_value_gen = 7.35
158     No, maintain solution and obj[gen] = 7.35 , and the tolerance_counter = 3
159     solution chromosome =
160         first level: [ [2.11 4.17]
161         second level: [1. 0.]
162         third level: [4. 7.] ]
163    The No. 14 iteration is finished!

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164
165 Beging the No. 15 iteration:
166 obj[gen-1] = 7.35 temp_best_value_gen = 7.35
167 No, maintain solution and obj[gen] = 7.35 , and the tolerance_counter = 4
168 solution chromosome =
169 first level: [ [2.11 4.17]
170 second level: [1. 0.]
171 third level: [4. 7.] ]
172 The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175 obj[gen-1] = 7.35 temp_best_value_gen = 7.35
176 No, maintain solution and obj[gen] = 7.35 , and the tolerance_counter = 5
177 solution chromosome =
178 first level: [ [2.11 4.17]
179 second level: [1. 0.]
180 third level: [4. 7.] ]
181 The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
184 obj[gen-1] = 7.35 temp_best_value_gen = 7.35
185 No, maintain solution and obj[gen] = 7.35 , and the tolerance_counter = 6
186 solution chromosome =
187 first level: [ [2.11 4.17]
188 second level: [1. 0.]
189 third level: [4. 7.] ]
190 The No. 17 iteration is finished!
191
192
193 -----
194 The iteration is terminated and then visulize the solution:
195 solution chromosome =
196 first level: [ [2.11 4.17]
197 second level: [1. 0.]
198 third level: [4. 7.] ]
199 Objective function values and some other indicators:
200 Obj0 = 2.00 Obj1 = 8.70 Obj0 + Obj1 = 10.70
201 Total movement of crane: 7.70
202 Total waiting time in berth position: 1.00
203 Total index of q during berthing: 27.00
204 Specific arrangement for each vessel:
205 V_id: 0 li: 4.0 xi: 2.1 bow of i: 0.1 tail of i: 4.1 gama_i0: 1.0 gama_i1: 3.0
206 duration_time_i: 2.0 demand_i: 160.0 work load_i: 160.0 work load gap_i: 0
207 V_id: 1 li: 8.0 xi: 4.2 bow of i: 0.2 tail of i: 8.2 gama_i0: 0.0 gama_i1: 1.0
208 duration_time_i: 1.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0
209
210
207
208 Algorithm finished and the total CPU time: 143 s
209 End
210

```