


```

80     second level: [0. 2.]
81     third level: [4. 4.] ]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 7.06    temp_best_value_gen = 7.06
86     No, maintain solution and obj[gen] = 7.06 , and the tolerance_counter = 4
87     solution chromosome =
88         first level: [ [4. 4.37]
89         second level: [0. 2.]
90         third level: [4. 4.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 7.06    temp_best_value_gen = 5.50
95     Yes, update solution and obj[gen] = 5.50
96     solution chromosome =
97         first level: [ [2. 8.]
98         second level: [0. 2.]
99         third level: [4. 4.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
104     No, maintain solution and obj[gen] = 5.50 , and the tolerance_counter = 1
105     solution chromosome =
106         first level: [ [2. 8.]
107         second level: [0. 2.]
108         third level: [4. 4.] ]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
113     No, maintain solution and obj[gen] = 5.50 , and the tolerance_counter = 2
114     solution chromosome =
115         first level: [ [2. 8.]
116         second level: [0. 2.]
117         third level: [4. 4.] ]
118    The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121     obj[gen-1] = 5.50    temp_best_value_gen = 5.50
122     No, maintain solution and obj[gen] = 5.50 , and the tolerance_counter = 3
123     solution chromosome =
124         first level: [ [2. 8.]
125         second level: [0. 2.]
126         third level: [4. 4.] ]
127    The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130     obj[gen-1] = 5.50    temp_best_value_gen = 3.50
131     Yes, update solution and obj[gen] = 3.50
132     solution chromosome =
133         first level: [ [2. 8.]
134         second level: [0. 1.]
135         third level: [4. 4.] ]
136    The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139     obj[gen-1] = 3.50    temp_best_value_gen = 3.50
140     No, maintain solution and obj[gen] = 3.50 , and the tolerance_counter = 1
141     solution chromosome =
142         first level: [ [2. 8.]
143         second level: [0. 1.]
144         third level: [4. 4.] ]
145    The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148     obj[gen-1] = 3.50    temp_best_value_gen = 3.50
149     No, maintain solution and obj[gen] = 3.50 , and the tolerance_counter = 2
150     solution chromosome =
151         first level: [ [2. 8.]
152         second level: [0. 1.]
153         third level: [4. 4.] ]
154    The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157     obj[gen-1] = 3.50    temp_best_value_gen = 3.50
158     No, maintain solution and obj[gen] = 3.50 , and the tolerance_counter = 3
159     solution chromosome =
160         first level: [ [2. 8.]
161         second level: [0. 1.]
162         third level: [4. 4.] ]
163    The No. 14 iteration is finished!

```

```

164
165 Beging the No. 15 iteration:
166 obj[gen-1] = 3.50 temp_best_value_gen = 3.50
167 No, maintain solution and obj[gen] = 3.50 , and the tolerance_counter = 4
168 solution chromosome =
169 first level: [ [2. 8.]
170 second level: [0. 1.]
171 third level: [4. 4.] ]
172 The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175 obj[gen-1] = 3.50 temp_best_value_gen = 3.50
176 No, maintain solution and obj[gen] = 3.50 , and the tolerance_counter = 5
177 solution chromosome =
178 first level: [ [2. 8.]
179 second level: [0. 1.]
180 third level: [4. 4.] ]
181 The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
184 obj[gen-1] = 3.50 temp_best_value_gen = 3.50
185 No, maintain solution and obj[gen] = 3.50 , and the tolerance_counter = 6
186 solution chromosome =
187 first level: [ [2. 8.]
188 second level: [0. 1.]
189 third level: [4. 4.] ]
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. 8.]
197 second level: [0. 1.]
198 third level: [4. 4.] ]
199 Objective function values and some other indicators:
200 Obj0 = 2.00 Obj1 = 1.00 Obj0 + Obj1 = 3.00
201 Total movement of crane: 0.00
202 Total waiting time in berth position: 1.00
203 Total index of q during berthing: 43.00
204 Specific arrangement for each vessel:
205 V_id: 0 li: 4.0 xi: 2.0 bow of i: 0.0 tail of i: 4.0 gama_i0: 0.0 gama_i1: 2.0
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: 8.0 bow of i: 4.0 tail of i: 12.0 gama_i0: 1.0 gama_i1: 3.0
208 duration_time_i: 2.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0
209
210 Algorithm finished and the total CPU time: 454 s
211 End

```