


```

80     second level: [2. 0. 0. 0. 3.]
81     third level: [2. 4. 4. 3. 5.] ]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 11.00   temp_best_value_gen = 10.00
86     Yes, update solution and obj[gen] = 10.00
87     solution chromosome =
88         first level: [ [ 1.5  5.5 11.  16.5 21.5]
89         second level: [2. 0. 0. 0. 3.]
90         third level: [2. 4. 4. 3. 2.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 10.00   temp_best_value_gen = 10.00
95     No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 1
96     solution chromosome =
97         first level: [ [ 1.5  5.5 11.  16.5 21.5]
98         second level: [2. 0. 0. 0. 3.]
99         third level: [2. 4. 4. 3. 2.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 10.00   temp_best_value_gen = 10.00
104     No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 2
105     solution chromosome =
106         first level: [ [ 1.5  5.5 11.  16.5 21.5]
107         second level: [2. 0. 0. 0. 3.]
108         third level: [2. 4. 4. 3. 2.] ]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 10.00   temp_best_value_gen = 10.00
113     No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 3
114     solution chromosome =
115         first level: [ [ 1.5  5.5 11.  16.5 21.5]
116         second level: [2. 0. 0. 0. 3.]
117         third level: [2. 4. 4. 3. 2.] ]
118    The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121     obj[gen-1] = 10.00   temp_best_value_gen = 10.00
122     No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 4
123     solution chromosome =
124         first level: [ [ 1.5  5.5 11.  16.5 21.5]
125         second level: [2. 0. 0. 0. 3.]
126         third level: [2. 4. 4. 3. 2.] ]
127    The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130     obj[gen-1] = 10.00   temp_best_value_gen = 10.00
131     No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 5
132     solution chromosome =
133         first level: [ [ 1.5  5.5 11.  16.5 21.5]
134         second level: [2. 0. 0. 0. 3.]
135         third level: [2. 4. 4. 3. 2.] ]
136    The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139     obj[gen-1] = 10.00   temp_best_value_gen = 10.00
140     No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 6
141     solution chromosome =
142         first level: [ [ 1.5  5.5 11.  16.5 21.5]
143         second level: [2. 0. 0. 0. 3.]
144         third level: [2. 4. 4. 3. 2.] ]
145    The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148     obj[gen-1] = 10.00   temp_best_value_gen = 10.00
149     No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 7
150     solution chromosome =
151         first level: [ [ 1.5  5.5 11.  16.5 21.5]
152         second level: [2. 0. 0. 0. 3.]
153         third level: [2. 4. 4. 3. 2.] ]
154    The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157     obj[gen-1] = 10.00   temp_best_value_gen = 10.00
158     No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 8
159     solution chromosome =
160         first level: [ [ 1.5  5.5 11.  16.5 21.5]
161         second level: [2. 0. 0. 0. 3.]
162         third level: [2. 4. 4. 3. 2.] ]
163    The No. 14 iteration is finished!

```

```

164
165 Beging the No. 15 iteration:
166 obj[gen-1] = 10.00 temp_best_value_gen = 10.00
167 No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 9
168 solution chromosome =
169 first level: [ [ 1.5 5.5 11. 16.5 21.5]
170 second level: [2. 0. 0. 0. 3.]
171 third level: [2. 4. 4. 3. 2.] ]
172 The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175 obj[gen-1] = 10.00 temp_best_value_gen = 10.00
176 No, maintain solution and obj[gen] = 10.00 , and the tolerance_counter = 10
177 solution chromosome =
178 first level: [ [ 1.5 5.5 11. 16.5 21.5]
179 second level: [2. 0. 0. 0. 3.]
180 third level: [2. 4. 4. 3. 2.] ]
181 The No. 16 iteration is finished!
182
183
184 -----
185 The iteration is terminated and then visulize the solution:
186 solution chromosome =
187 first level: [ [ 1.5 5.5 11. 16.5 21.5]
188 second level: [2. 0. 0. 0. 3.]
189 third level: [2. 4. 4. 3. 2.] ]
190 Objective function values and some other indicators:
191 Obj0 = 5.00 Obj1 = 5.00 Obj0 + Obj1 = 10.00
192 Total movement of crane: 0.00
193 Total waiting time in berth position: 5.00
194 Total index of q during berthing: 268.00
195 Specific arrangement for each vessel:
196 V_id: 0 li: 3.0 xi: 1.5 bow of i: 0.0 tail of i: 3.0 gama_i0: 2.0 gama_i1: 6.0
duration_time_i: 4.0 demand_i: 140.0 work load_i: 140.0 work load gap_i: 0
197 V_id: 1 li: 5.0 xi: 5.5 bow of i: 3.0 tail of i: 8.0 gama_i0: 0.0 gama_i1: 1.0
duration_time_i: 1.0 demand_i: 80.0 work load_i: 80.0 work load gap_i: 0
198 V_id: 2 li: 6.0 xi: 11.0 bow of i: 8.0 tail of i: 14.0 gama_i0: 0.0 gama_i1: 2
.0 duration_time_i: 2.0 demand_i: 160.0 work load_i: 160.0 work load gap_i: 0
199 V_id: 3 li: 5.0 xi: 16.5 bow of i: 14.0 tail of i: 19.0 gama_i0: 0.0 gama_i1: 2
.0 duration_time_i: 2.0 demand_i: 100.0 work load_i: 100.0 work load gap_i: 0
200 V_id: 4 li: 5.0 xi: 21.5 bow of i: 19.0 tail of i: 24.0 gama_i0: 3.0 gama_i1: 6
.0 duration_time_i: 3.0 demand_i: 100.0 work load_i: 100.0 work load gap_i: 0
201
202 Algorithm finished and the total CPU time: 966 s
203 End
204

```