


```

80     second level: [2. 2.]
81     third level: [2. 2.] ]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 9.50    temp_best_value_gen = 9.00
86     Yes, update solution and obj[gen] = 9.00
87     solution chromosome =
88         first level: [ [2. 8.]
89         second level: [2. 1.]
90         third level: [2. 4.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 9.00    temp_best_value_gen = 9.00
95     No, maintain solution and obj[gen] = 9.00 , and the tolerance_counter = 1
96     solution chromosome =
97         first level: [ [2. 8.]
98         second level: [2. 1.]
99         third level: [2. 4.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 9.00    temp_best_value_gen = 9.00
104     No, maintain solution and obj[gen] = 9.00 , and the tolerance_counter = 2
105     solution chromosome =
106         first level: [ [2. 8.]
107         second level: [2. 1.]
108         third level: [2. 4.] ]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 9.00    temp_best_value_gen = 9.00
113     No, maintain solution and obj[gen] = 9.00 , and the tolerance_counter = 3
114     solution chromosome =
115         first level: [ [2. 8.]
116         second level: [2. 1.]
117         third level: [2. 4.] ]
118    The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121     obj[gen-1] = 9.00    temp_best_value_gen = 9.00
122     No, maintain solution and obj[gen] = 9.00 , and the tolerance_counter = 4
123     solution chromosome =
124         first level: [ [2. 8.]
125         second level: [2. 1.]
126         third level: [2. 4.] ]
127    The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130     obj[gen-1] = 9.00    temp_best_value_gen = 9.00
131     No, maintain solution and obj[gen] = 9.00 , and the tolerance_counter = 5
132     solution chromosome =
133         first level: [ [2. 8.]
134         second level: [2. 1.]
135         third level: [2. 4.] ]
136    The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139     obj[gen-1] = 9.00    temp_best_value_gen = 4.00
140     Yes, update solution and obj[gen] = 4.00
141     solution chromosome =
142         first level: [ [2. 8.]
143         second level: [1. 1.]
144         third level: [4. 4.] ]
145    The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148     obj[gen-1] = 4.00    temp_best_value_gen = 4.00
149     No, maintain solution and obj[gen] = 4.00 , and the tolerance_counter = 1
150     solution chromosome =
151         first level: [ [2. 8.]
152         second level: [1. 1.]
153         third level: [4. 4.] ]
154    The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157     obj[gen-1] = 4.00    temp_best_value_gen = 4.00
158     No, maintain solution and obj[gen] = 4.00 , and the tolerance_counter = 2
159     solution chromosome =
160         first level: [ [2. 8.]
161         second level: [1. 1.]
162         third level: [4. 4.] ]
163    The No. 14 iteration is finished!

```

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164
165 Beging the No. 15 iteration:
166 obj[gen-1] = 4.00 temp_best_value_gen = 4.00
167 No, maintain solution and obj[gen] = 4.00 , and the tolerance_counter = 3
168 solution chromosome =
169 first level: [ [2. 8.]
170 second level: [1. 1.]
171 third level: [4. 4.] ]
172 The No. 15 iteration is finished!
173
174 Beging the No. 16 iteration:
175 obj[gen-1] = 4.00 temp_best_value_gen = 4.00
176 No, maintain solution and obj[gen] = 4.00 , and the tolerance_counter = 4
177 solution chromosome =
178 first level: [ [2. 8.]
179 second level: [1. 1.]
180 third level: [4. 4.] ]
181 The No. 16 iteration is finished!
182
183 Beging the No. 17 iteration:
184 obj[gen-1] = 4.00 temp_best_value_gen = 4.00
185 No, maintain solution and obj[gen] = 4.00 , and the tolerance_counter = 5
186 solution chromosome =
187 first level: [ [2. 8.]
188 second level: [1. 1.]
189 third level: [4. 4.] ]
190 The No. 17 iteration is finished!
191
192 Beging the No. 18 iteration:
193 obj[gen-1] = 4.00 temp_best_value_gen = 4.00
194 No, maintain solution and obj[gen] = 4.00 , and the tolerance_counter = 6
195 solution chromosome =
196 first level: [ [2. 8.]
197 second level: [1. 1.]
198 third level: [4. 4.] ]
199 The No. 18 iteration is finished!
200
201
202 -----
203 The iteration is terminated and then visulize the solution:
204 solution chromosome =
205 first level: [ [2. 8.]
206 second level: [1. 1.]
207 third level: [4. 4.] ]
208 Objective function values and some other indicators:
209 Obj0 = 2.00 Obj1 = 2.00 Obj0 + Obj1 = 4.00
210 Total movement of crane: 0.00
211 Total waiting time in berth position: 2.00
212 Total index of q during berthing: 43.00
213 Specific arrangement for each vessel:
214 V_id: 0 li: 4.0 xi: 2.0 bow of i: 0.0 tail of i: 4.0 gama_i0: 1.0 gama_i1: 3.0
215 duration_time_i: 2.0 demand_i: 160.0 work load_i: 160.0 work load gap_i: 0
216 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
217 duration_time_i: 2.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0
218
219 Algorithm finished and the total CPU time: 160 s
220 End
221

```