



```

80     second level: [0. 2. 0. 1. 2. 4. 1.]
81     third level: [4. 3. 4. 3. 2. 7. 4.] ]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
86     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 1
87     solution chromosome =
88         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
89         second level: [0. 2. 0. 1. 2. 4. 1.]
90         third level: [4. 3. 4. 3. 2. 7. 4.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
95     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 2
96     solution chromosome =
97         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
98         second level: [0. 2. 0. 1. 2. 4. 1.]
99         third level: [4. 3. 4. 3. 2. 7. 4.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
104     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 3
105     solution chromosome =
106         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
107         second level: [0. 2. 0. 1. 2. 4. 1.]
108         third level: [4. 3. 4. 3. 2. 7. 4.] ]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
113     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 4
114     solution chromosome =
115         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
116         second level: [0. 2. 0. 1. 2. 4. 1.]
117         third level: [4. 3. 4. 3. 2. 7. 4.] ]
118    The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
122     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 5
123     solution chromosome =
124         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
125         second level: [0. 2. 0. 1. 2. 4. 1.]
126         third level: [4. 3. 4. 3. 2. 7. 4.] ]
127    The No. 10 iteration is finished!
128
129 Beging the No. 11 iteration:
130     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
131     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 6
132     solution chromosome =
133         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
134         second level: [0. 2. 0. 1. 2. 4. 1.]
135         third level: [4. 3. 4. 3. 2. 7. 4.] ]
136    The No. 11 iteration is finished!
137
138 Beging the No. 12 iteration:
139     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
140     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 7
141     solution chromosome =
142         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
143         second level: [0. 2. 0. 1. 2. 4. 1.]
144         third level: [4. 3. 4. 3. 2. 7. 4.] ]
145    The No. 12 iteration is finished!
146
147 Beging the No. 13 iteration:
148     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
149     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 8
150     solution chromosome =
151         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
152         second level: [0. 2. 0. 1. 2. 4. 1.]
153         third level: [4. 3. 4. 3. 2. 7. 4.] ]
154    The No. 13 iteration is finished!
155
156 Beging the No. 14 iteration:
157     obj[gen-1] = 11.60   temp_best_value_gen = 11.60
158     No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 9
159     solution chromosome =
160         first level: [ [ 2.   5.5 25.5 18.  22.5  4.5 11.5]
161         second level: [0. 2. 0. 1. 2. 4. 1.]
162         third level: [4. 3. 4. 3. 2. 7. 4.] ]
163    The No. 14 iteration is finished!

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164
165 Beging the No. 15 iteration:
166 obj[gen-1] = 11.60 temp_best_value_gen = 11.60
167 No, maintain solution and obj[gen] = 11.60 , and the tolerance_counter = 10
168 solution chromosome =
169 first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
170 second level: [0. 2. 0. 1. 2. 4. 1.]
171 third level: [4. 3. 4. 3. 2. 7. 4.] ]
172 The No. 15 iteration is finished!
173
174
175 -----
176 The iteration is terminated and then visulize the solution:
177 solution chromosome =
178 first level: [ [ 2. 5.5 25.5 18. 22.5 4.5 11.5]
179 second level: [0. 2. 0. 1. 2. 4. 1.]
180 third level: [4. 3. 4. 3. 2. 7. 4.] ]
181 Objective function values and some other indicators:
182 Obj0 = 4.00 Obj1 = 40.00 Obj0 + Obj1 = 44.00
183 Total movement of crane: 30.00
184 Total waiting time in berth position: 10.00
185 Total index of q during berthing: 421.00
186 Specific arrangement for each vessel:
187 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
duration_time_i: 2.0 demand_i: 100.0 work load_i: 100.0 work load gap_i: 0
188 V_id: 1 li: 3.0 xi: 5.5 bow of i: 4.0 tail of i: 7.0 gama_i0: 2.0 gama_i1: 4.0
duration_time_i: 2.0 demand_i: 80.0 work load_i: 80.0 work load gap_i: 0
189 V_id: 2 li: 9.0 xi: 25.5 bow of i: 21.0 tail of i: 30.0 gama_i0: 0.0 gama_i1: 2
.0 duration_time_i: 2.0 demand_i: 140.0 work load_i: 140.0 work load gap_i: 0
190 V_id: 3 li: 4.0 xi: 18.0 bow of i: 16.0 tail of i: 20.0 gama_i0: 1.0 gama_i1: 4
.0 duration_time_i: 3.0 demand_i: 140.0 work load_i: 140.0 work load gap_i: 0
191 V_id: 4 li: 5.0 xi: 22.5 bow of i: 20.0 tail of i: 25.0 gama_i0: 2.0 gama_i1: 4
.0 duration_time_i: 2.0 demand_i: 80.0 work load_i: 80.0 work load gap_i: 0
192 V_id: 5 li: 7.0 xi: 4.5 bow of i: 1.0 tail of i: 8.0 gama_i0: 4.0 gama_i1: 5.0
duration_time_i: 1.0 demand_i: 120.0 work load_i: 120.0 work load gap_i: 0
193 V_id: 6 li: 4.0 xi: 11.5 bow of i: 9.5 tail of i: 13.5 gama_i0: 1.0 gama_i1: 2
.0 duration_time_i: 1.0 demand_i: 60.0 work load_i: 60.0 work load gap_i: 0
194
195 Algorithm finished and the total CPU time: 1251 s
196 End
197

```