


```

80     second level: [ 7. 0. 0. 1. 2. 3. 1. 5. 9. 13. 14.]
81     third level: [4. 3. 4. 3. 6. 2. 3. 4. 1. 4. 5.] ]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 36.50   temp_best_value_gen = 36.50
86     No, maintain solution and obj[gen] = 36.50 , and the tolerance_counter = 6
87     solution chromosome =
88     first level: [ [ 4. 9.5 13.5 19.5 25.5 4. 4. 2. 2. 4.5 4.5]
89     second level: [ 7. 0. 0. 1. 2. 3. 1. 5. 9. 13. 14.]
90     third level: [4. 3. 4. 3. 6. 2. 3. 4. 1. 4. 5.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 36.50   temp_best_value_gen = 36.50
95     No, maintain solution and obj[gen] = 36.50 , and the tolerance_counter = 7
96     solution chromosome =
97     first level: [ [ 4. 9.5 13.5 19.5 25.5 4. 4. 2. 2. 4.5 4.5]
98     second level: [ 7. 0. 0. 1. 2. 3. 1. 5. 9. 13. 14.]
99     third level: [4. 3. 4. 3. 6. 2. 3. 4. 1. 4. 5.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 36.50   temp_best_value_gen = 36.50
104     No, maintain solution and obj[gen] = 36.50 , and the tolerance_counter = 8
105     solution chromosome =
106     first level: [ [ 4. 9.5 13.5 19.5 25.5 4. 4. 2. 2. 4.5 4.5]
107     second level: [ 7. 0. 0. 1. 2. 3. 1. 5. 9. 13. 14.]
108     third level: [4. 3. 4. 3. 6. 2. 3. 4. 1. 4. 5.] ]
109    The No. 8 iteration is finished!
110
111 Beging the No. 9 iteration:
112     obj[gen-1] = 36.50   temp_best_value_gen = 36.50
113     No, maintain solution and obj[gen] = 36.50 , and the tolerance_counter = 9
114     solution chromosome =
115     first level: [ [ 4. 9.5 13.5 19.5 25.5 4. 4. 2. 2. 4.5 4.5]
116     second level: [ 7. 0. 0. 1. 2. 3. 1. 5. 9. 13. 14.]
117     third level: [4. 3. 4. 3. 6. 2. 3. 4. 1. 4. 5.] ]
118    The No. 9 iteration is finished!
119
120 Beging the No. 10 iteration:
121     obj[gen-1] = 36.50   temp_best_value_gen = 36.50
122     No, maintain solution and obj[gen] = 36.50 , and the tolerance_counter = 10
123     solution chromosome =
124     first level: [ [ 4. 9.5 13.5 19.5 25.5 4. 4. 2. 2. 4.5 4.5]
125     second level: [ 7. 0. 0. 1. 2. 3. 1. 5. 9. 13. 14.]
126     third level: [4. 3. 4. 3. 6. 2. 3. 4. 1. 4. 5.] ]
127    The No. 10 iteration is finished!
128
129 -----
130
131 The iteration is terminated and then visulize the solution:
132     solution chromosome =
133     first level: [ [ 4. 9.5 13.5 19.5 25.5 4. 4. 2. 2. 4.5 4.5]
134     second level: [ 7. 0. 0. 1. 2. 3. 1. 5. 9. 13. 14.]
135     third level: [4. 3. 4. 3. 6. 2. 3. 4. 1. 4. 5.] ]
136 Objective function values and some other indicators:
137     Obj0 = 14.00      Obj1 = 99.00      Obj0 + Obj1 = 113.00
138     Total movement of crane: 30.00
139     Total waiting time in berth position: 55.00
140     Total index of q during berthing: 313.00
141     Specific arrangement for each vessel:
142     V_id: 0          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 7.0          gama_i1: 9.0
143           duration_time_i: 2.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
144     V_id: 1          li: 3.0          xi: 9.5          bow of i: 8.0          tail of i: 11.0          gama_i0: 0.0          gama_i1: 1.0
145           duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
146     V_id: 2          li: 5.0          xi: 13.5          bow of i: 11.0          tail of i: 16.0          gama_i0: 0.0          gama_i1: 2
147           duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
148     V_id: 3          li: 7.0          xi: 19.5          bow of i: 16.0          tail of i: 23.0          gama_i0: 1.0          gama_i1: 2
149           duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
150     V_id: 4          li: 9.0          xi: 25.5          bow of i: 21.0          tail of i: 30.0          gama_i0: 2.0          gama_i1: 3
151           duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
152     V_id: 5          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 3.0          gama_i1: 5.0
153           duration_time_i: 2.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
154     V_id: 6          li: 8.0          xi: 4.0          bow of i: 0.0          tail of i: 8.0          gama_i0: 1.0          gama_i1: 3.0
155           duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
156     V_id: 7          li: 4.0          xi: 2.0          bow of i: 0.0          tail of i: 4.0          gama_i0: 5.0          gama_i1: 7.0
157           duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
158     V_id: 8          li: 4.0          xi: 2.0          bow of i: 0.0          tail of i: 4.0          gama_i0: 9.0          gama_i1: 13.0
159           duration time_i: 4.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
160     V_id: 9          li: 9.0          xi: 4.5          bow of i: 0.0          tail of i: 9.0          gama_i0: 13.0          gama_i1: 14.0
161           duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
162     V_id: 10         li: 9.0          xi: 4.5          bow of i: 0.0          tail of i: 9.0          gama_i0: 14.0          gama_i1: 15.
163           0          duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0

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unknown

```
153
154 Algorithm finished and the total CPU time: 1299 s
155 End
156
```