


```

80     second level: [ 4. 0. 1. 6. 7. 8. 10. 10. 14. 15. 18. 17. 15. 19.]
81     third level: [6. 6. 3. 7. 8. 3. 3. 2. 3. 3. 6. 5. 6. 4.] ]
82     The No. 5 iteration is finished!
83
84 Beging the No. 6 iteration:
85     obj[gen-1] = 72.53   temp_best_value_gen = 68.77
86     Yes, update solution and obj[gen] = 68.77
87     solution chromosome =
88     first level: [ [3.6 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 3.72 4.98 3.2 8.35 3.21]
89     second level: [20. 0. 1. 6. 7. 10. 14. 14. 18. 4. 8. 9. 4. 13.]
90     third level: [2. 6. 3. 7. 8. 2. 6. 2. 2. 3. 6. 5. 6. 4.] ]
91     The No. 6 iteration is finished!
92
93 Beging the No. 7 iteration:
94     obj[gen-1] = 68.77   temp_best_value_gen = 68.77
95     No, maintain solution and obj[gen] = 68.77 , and the tolerance_counter = 1
96     solution chromosome =
97     first level: [ [3.6 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 3.72 4.98 3.2 8.35 3.21]
98     second level: [20. 0. 1. 6. 7. 10. 14. 14. 18. 4. 8. 9. 4. 13.]
99     third level: [2. 6. 3. 7. 8. 2. 6. 2. 2. 3. 6. 5. 6. 4.] ]
100    The No. 7 iteration is finished!
101
102 Beging the No. 8 iteration:
103     obj[gen-1] = 68.77   temp_best_value_gen = 68.77
104     No, maintain solution and obj[gen] = 68.77 , and the tolerance_counter = 2
105     solution chromosome =
106     first level: [ [3.6 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 3.72 4.98 3.2 8.35 3.21]
107     second level: [20. 0. 1. 6. 7. 10. 14. 14. 18. 4. 8. 9. 4. 13.]
108     third level: [2. 6. 3. 7. 8. 2. 6. 2. 2. 3. 6. 5. 6. 4.] ]
109    The No. 8 iteration is finished!
110
111
112 -----
113 The iteration is terminated and then visulize the solution:
114     solution chromosome =
115     first level: [ [3.6 5.11 6.1 5.41 5.48 3.69 8.98 2.47 2.33 3.72 4.98 3.2 8.35 3.21]
116     second level: [20. 0. 1. 6. 7. 10. 14. 14. 18. 4. 8. 9. 4. 13.]
117     third level: [2. 6. 3. 7. 8. 2. 6. 2. 2. 3. 6. 5. 6. 4.] ]
118 Objective function values and some other indicators:
119     Obj0 = 23.00         Obj1 = 250.68         Obj0 + Obj1 = 273.68
120     Total movement of crane: 32.68
121     Total waiting time in berth position: 128.00
122     Total index of q during berthing: 224.00
123 Specific arrangement for each vessel:
124     V_id: 0             li: 7.0             xi: 3.6             bow of i: 0.1             tail of i: 7.1             gama_i0: 20.0             gama_i1: 24.0
125     duration_time_i: 4.0             demand_i: 160.0             work load_i: 160.0             work load gap_i: 0
126     V_id: 1             li: 6.0             xi: 5.1             bow of i: 2.1             tail of i: 8.1             gama_i0: 0.0             gama_i1: 1.0
127     duration_time_i: 1.0             demand_i: 80.0             work load_i: 80.0             work load gap_i: 0
128     V_id: 2             li: 8.0             xi: 6.1             bow of i: 2.1             tail of i: 10.1             gama_i0: 1.0             gama_i1: 4.0
129     duration_time_i: 3.0             demand_i: 140.0             work load_i: 140.0             work load gap_i: 0
130     V_id: 3             li: 7.0             xi: 5.4             bow of i: 1.9             tail of i: 8.9             gama_i0: 6.0             gama_i1: 7.0
131     duration_time_i: 1.0             demand_i: 120.0             work load_i: 120.0             work load gap_i: 0
132     V_id: 4             li: 8.0             xi: 5.5             bow of i: 1.5             tail of i: 9.5             gama_i0: 7.0             gama_i1: 8.0
133     duration_time_i: 1.0             demand_i: 160.0             work load_i: 160.0             work load gap_i: 0
134     V_id: 5             li: 4.0             xi: 3.7             bow of i: 1.7             tail of i: 5.7             gama_i0: 10.0             gama_i1: 13.0
135     duration_time_i: 3.0             demand_i: 100.0             work load_i: 100.0             work load gap_i: 0
136     V_id: 6             li: 9.0             xi: 9.0             bow of i: 4.5             tail of i: 13.5             gama_i0: 14.0             gama_i1: 16.0
137     duration_time_i: 2.0             demand_i: 140.0             work load_i: 140.0             work load gap_i: 0
138     V_id: 7             li: 3.0             xi: 2.5             bow of i: 1.0             tail of i: 4.0             gama_i0: 14.0             gama_i1: 18.0
139     duration_time_i: 4.0             demand_i: 160.0             work load_i: 160.0             work load gap_i: 0
140     V_id: 8             li: 4.0             xi: 2.3             bow of i: 0.3             tail of i: 4.3             gama_i0: 18.0             gama_i1: 20.0
141     duration_time_i: 2.0             demand_i: 60.0             work load_i: 60.0             work load gap_i: 0
142     V_id: 9             li: 3.0             xi: 3.7             bow of i: 2.2             tail of i: 5.2             gama_i0: 4.0             gama_i1: 6.0
143     duration_time_i: 2.0             demand_i: 80.0             work load_i: 80.0             work load gap_i: 0
144     V_id: 10            li: 9.0             xi: 5.0             bow of i: 0.5             tail of i: 9.5             gama_i0: 8.0             gama_i1: 9.0
145     duration_time_i: 1.0             demand_i: 120.0             work load_i: 120.0             work load gap_i: 0
146     V_id: 11            li: 6.0             xi: 3.2             bow of i: 0.2             tail of i: 6.2             gama_i0: 9.0             gama_i1: 10.0
147     duration_time_i: 1.0             demand_i: 60.0             work load_i: 60.0             work load gap_i: 0
148     V_id: 12            li: 6.0             xi: 8.3             bow of i: 5.3             tail of i: 11.3             gama_i0: 4.0             gama_i1: 5.0
149     duration_time_i: 1.0             demand_i: 100.0             work load_i: 100.0             work load gap_i: 0
150     V_id: 13            li: 4.0             xi: 3.2             bow of i: 1.2             tail of i: 5.2             gama_i0: 13.0             gama_i1: 14.0
151     duration_time_i: 1.0             demand_i: 80.0             work load_i: 80.0             work load gap_i: 0
152
153 Algorithm finished and the total CPU time: 1310 s
154 End
155

```