



```

80  obj[gen-1] = 55.90  temp_best_value_gen = 55.90
81  No, maintain solution and obj[gen] = 55.90 , and the tolerance_counter = 5
82  solution chromosome =
83  first level: [ [ 3.5 8.5 4.5 23.5 26. 14.5 3.5 1.5 4. 3. 2. 4. 3. 2.
84  4.5 4. ]
85  second level: [ 2. 0. 3. 0. 1. 4. 1. 4. 7. 9. 11. 13. 16. 17. 20. 21.]
86  third level: [ 7. 2. 7. 4. 5. 4. 7. 2. 2. 6. 3. 2. 5. 3. 7. 4. ] ]
87  The No. 5 iteration is finished!
88
89  Beging the No. 6 iteration:
90  obj[gen-1] = 55.90  temp_best_value_gen = 55.90
91  No, maintain solution and obj[gen] = 55.90 , and the tolerance_counter = 6
92  solution chromosome =
93  first level: [ [ 3.5 8.5 4.5 23.5 26. 14.5 3.5 1.5 4. 3. 2. 4. 3. 2.
94  4.5 4. ]
95  second level: [ 2. 0. 3. 0. 1. 4. 1. 4. 7. 9. 11. 13. 16. 17. 20. 21.]
96  third level: [ 7. 2. 7. 4. 5. 4. 7. 2. 2. 6. 3. 2. 5. 3. 7. 4. ] ]
97  The No. 6 iteration is finished!
98
99  Beging the No. 7 iteration:
100 obj[gen-1] = 55.90  temp_best_value_gen = 55.90
101 No, maintain solution and obj[gen] = 55.90 , and the tolerance_counter = 7
102 solution chromosome =
103 first level: [ [ 3.5 8.5 4.5 23.5 26. 14.5 3.5 1.5 4. 3. 2. 4. 3. 2.
104 4.5 4. ]
105 second level: [ 2. 0. 3. 0. 1. 4. 1. 4. 7. 9. 11. 13. 16. 17. 20. 21.]
106 third level: [ 7. 2. 7. 4. 5. 4. 7. 2. 2. 6. 3. 2. 5. 3. 7. 4. ] ]
107 The No. 7 iteration is finished!
108
109 -----
110
111 The iteration is terminated and then visulize the solution:
112 solution chromosome =
113 first level: [ [ 3.5 8.5 4.5 23.5 26. 14.5 3.5 1.5 4. 3. 2. 4. 3. 2.
114 4.5 4. ]
115 second level: [ 2. 0. 3. 0. 1. 4. 1. 4. 7. 9. 11. 13. 16. 17. 20. 21.]
116 third level: [ 7. 2. 7. 4. 5. 4. 7. 2. 2. 6. 3. 2. 5. 3. 7. 4. ] ]
117 Objective function values and some other indicators:
118 Obj0 = 22.00      Obj1 = 141.00      Obj0 + Obj1 = 163.00
119 Total movement of crane: 12.00
120 Total waiting time in berth position: 129.00
121 Total index of q during berthing: 277.00
122 Specific arrangement for each vessel:
123 V_id: 0      li: 7.0      xi: 3.5      bow of i: 0.0      tail of i: 7.0      gama_i0: 2.0      gama_i1: 3.0
124      duration_time_i: 1.0      demand_i: 80.0      work load_i: 80.0      work load gap_i: 0
125 V_id: 1      li: 3.0      xi: 8.5      bow of i: 7.0      tail of i: 10.0      gama_i0: 0.0      gama_i1: 2.0
126      duration_time_i: 2.0      demand_i: 60.0      work load_i: 60.0      work load gap_i: 0
127 V_id: 2      li: 9.0      xi: 4.5      bow of i: 0.0      tail of i: 9.0      gama_i0: 3.0      gama_i1: 4.0
128      duration_time_i: 1.0      demand_i: 100.0      work load_i: 100.0      work load gap_i: 0
129 V_id: 3      li: 9.0      xi: 23.5      bow of i: 19.0      tail of i: 28.0      gama_i0: 0.0      gama_i1: 1
130      duration_time_i: 1.0      demand_i: 60.0      work load_i: 60.0      work load gap_i: 0
131 V_id: 4      li: 8.0      xi: 26.0      bow of i: 22.0      tail of i: 30.0      gama_i0: 1.0      gama_i1: 2
132      duration_time_i: 1.0      demand_i: 60.0      work load_i: 60.0      work load gap_i: 0
133 V_id: 5      li: 9.0      xi: 14.5      bow of i: 10.0      tail of i: 19.0      gama_i0: 4.0      gama_i1: 5
134      duration_time_i: 1.0      demand_i: 80.0      work load_i: 80.0      work load gap_i: 0
135 V_id: 6      li: 7.0      xi: 3.5      bow of i: 0.0      tail of i: 7.0      gama_i0: 1.0      gama_i1: 2.0
136      duration_time_i: 1.0      demand_i: 120.0      work load_i: 120.0      work load gap_i: 0
137 V_id: 7      li: 3.0      xi: 1.5      bow of i: 0.0      tail of i: 3.0      gama_i0: 4.0      gama_i1: 7.0
138      duration_time_i: 3.0      demand_i: 100.0      work load_i: 100.0      work load gap_i: 0
139 V_id: 8      li: 8.0      xi: 4.0      bow of i: 0.0      tail of i: 8.0      gama_i0: 7.0      gama_i1: 9.0
140      duration_time_i: 2.0      demand_i: 80.0      work load_i: 80.0      work load gap_i: 0
141 V_id: 9      li: 6.0      xi: 3.0      bow of i: 0.0      tail of i: 6.0      gama_i0: 9.0      gama_i1: 11.0
142      duration_time_i: 2.0      demand_i: 160.0      work load_i: 160.0      work load gap_i: 0
143 V_id: 10     li: 4.0      xi: 2.0      bow of i: 0.0      tail of i: 4.0      gama_i0: 11.0      gama_i1: 13.
144      duration_time_i: 2.0      demand_i: 80.0      work load_i: 80.0      work load gap_i: 0
145 V_id: 11     li: 8.0      xi: 4.0      bow of i: 0.0      tail of i: 8.0      gama_i0: 13.0      gama_i1: 16.
146      duration_time_i: 3.0      demand_i: 120.0      work load_i: 120.0      work load gap_i: 0
147 V_id: 12     li: 6.0      xi: 3.0      bow of i: 0.0      tail of i: 6.0      gama_i0: 16.0      gama_i1: 17.
148      duration_time_i: 1.0      demand_i: 80.0      work load_i: 80.0      work load gap_i: 0
149 V_id: 13     li: 4.0      xi: 2.0      bow of i: 0.0      tail of i: 4.0      gama_i0: 17.0      gama_i1: 20.
150      duration_time_i: 3.0      demand_i: 140.0      work load_i: 140.0      work load gap_i: 0
151 V_id: 14     li: 9.0      xi: 4.5      bow of i: 0.0      tail of i: 9.0      gama_i0: 20.0      gama_i1: 21.
152      duration_time_i: 1.0      demand_i: 100.0      work load_i: 100.0      work load gap_i: 0
153 V_id: 15     li: 8.0      xi: 4.0      bow of i: 0.0      tail of i: 8.0      gama_i0: 21.0      gama_i1: 23.
154      duration_time_i: 2.0      demand_i: 120.0      work load_i: 120.0      work load gap_i: 0
155
156 Algorithm finished and the total CPU time: 1286 s
157 End
158

```