


```

80   third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.] ]
81   The No. 4 iteration is finished!
82
83   Beging the No. 5 iteration:
84   obj[gen-1] = 92.66   temp_best_value_gen = 92.66
85   No, maintain solution and obj[gen] = 92.66 , and the tolerance_counter = 3
86   solution chromosome =
87   first level: [ [ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
88   5.69 5.91 2.64 14.5 6.13 13.5 13. ]
89   second level: [13. 6. 8. 10. 1. 2. 4. 28. 17. 19. 23. 30. 26. 12. 33. 3. 0. 1.
90   6.]
91   third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.] ]
92   The No. 5 iteration is finished!
93
94   Beging the No. 6 iteration:
95   obj[gen-1] = 92.66   temp_best_value_gen = 92.66
96   No, maintain solution and obj[gen] = 92.66 , and the tolerance_counter = 4
97   solution chromosome =
98   first level: [ [ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
99   5.69 5.91 2.64 14.5 6.13 13.5 13. ]
100  second level: [13. 6. 8. 10. 1. 2. 4. 28. 17. 19. 23. 30. 26. 12. 33. 3. 0. 1.
101  6.]
102  third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.] ]
103  The No. 6 iteration is finished!
104
105
106 -----
107 The iteration is terminated and then visulize the solution:
108 solution chromosome =
109 first level: [ [ 3.57 5.27 3.35 3.99 5.9 6.64 3.45 5.24 4.57 5.25 2.96 2.67
110 5.69 5.91 2.64 14.5 6.13 13.5 13. ]
111 second level: [13. 6. 8. 10. 1. 2. 4. 28. 17. 19. 23. 30. 26. 12. 33. 3. 0. 1.
112 6.]
113 third level: [2. 3. 6. 4. 6. 2. 4. 6. 4. 2. 2. 2. 6. 6. 3. 2. 8. 4. 3.] ]
114 Objective function values and some other indicators:
115 Obj0 = 34.00   Obj1 = 280.63   Obj0 + Obj1 = 314.63
116 Total movement of crane: 38.63
117 Total waiting time in berth position: 242.00
118 Total index of q during berthing: 452.00
119 Specific arrangement for each vessel:
120 V_id: 0   li: 7.0   xi: 3.6   bow of i: 0.1   tail of i: 7.1   gama_i0: 13.0   gama_i1: 17.0
      duration_time_i: 4.0   demand_i: 160.0   work load_i: 160.0   work load gap_i: 0
121 V_id: 1   li: 6.0   xi: 5.3   bow of i: 2.3   tail of i: 8.3   gama_i0: 6.0   gama_i1: 8.0
      duration_time_i: 2.0   demand_i: 80.0   work load_i: 80.0   work load gap_i: 0
122 V_id: 2   li: 6.0   xi: 3.3   bow of i: 0.3   tail of i: 6.3   gama_i0: 8.0   gama_i1: 10.0
      duration_time_i: 2.0   demand_i: 160.0   work load_i: 160.0   work load gap_i: 0
123 V_id: 3   li: 4.0   xi: 4.0   bow of i: 2.0   tail of i: 6.0   gama_i0: 10.0   gama_i1: 12.0
      duration_time_i: 2.0   demand_i: 120.0   work load_i: 120.0   work load gap_i: 0
124 V_id: 4   li: 9.0   xi: 5.9   bow of i: 1.4   tail of i: 10.4   gama_i0: 1.0   gama_i1: 2.0
      duration_time_i: 1.0   demand_i: 80.0   work load_i: 80.0   work load gap_i: 0
125 V_id: 5   li: 6.0   xi: 6.6   bow of i: 3.6   tail of i: 9.6   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
126 V_id: 6   li: 4.0   xi: 3.4   bow of i: 1.4   tail of i: 5.4   gama_i0: 4.0   gama_i1: 6.0
      duration_time_i: 2.0   demand_i: 140.0   work load_i: 140.0   work load gap_i: 0
127 V_id: 7   li: 6.0   xi: 5.2   bow of i: 2.2   tail of i: 8.2   gama_i0: 28.0   gama_i1: 30.0
      duration_time_i: 2.0   demand_i: 160.0   work load_i: 160.0   work load gap_i: 0
128 V_id: 8   li: 5.0   xi: 4.6   bow of i: 2.1   tail of i: 7.1   gama_i0: 17.0   gama_i1: 19.0
      duration_time_i: 2.0   demand_i: 160.0   work load_i: 160.0   work load gap_i: 0
129 V_id: 9   li: 7.0   xi: 5.3   bow of i: 1.8   tail of i: 8.8   gama_i0: 19.0   gama_i1: 23.0
      duration_time_i: 4.0   demand_i: 160.0   work load_i: 160.0   work load gap_i: 0
130 V_id: 10  li: 3.0   xi: 3.0   bow of i: 1.5   tail of i: 4.5   gama_i0: 23.0   gama_i1: 26.
0      duration_time_i: 3.0   demand_i: 120.0   work load_i: 120.0   work load gap_i: 0
131 V_id: 11  li: 4.0   xi: 2.7   bow of i: 0.7   tail of i: 4.7   gama_i0: 30.0   gama_i1: 33.
0      duration_time_i: 3.0   demand_i: 100.0   work load_i: 100.0   work load gap_i: 0
132 V_id: 12  li: 7.0   xi: 5.7   bow of i: 2.2   tail of i: 9.2   gama_i0: 26.0   gama_i1: 28.
0      duration_time_i: 2.0   demand_i: 160.0   work load_i: 160.0   work load gap_i: 0
133 V_id: 13  li: 8.0   xi: 5.9   bow of i: 1.9   tail of i: 9.9   gama_i0: 12.0   gama_i1: 13.
0      duration_time_i: 1.0   demand_i: 120.0   work load_i: 120.0   work load gap_i: 0
134 V_id: 14  li: 3.0   xi: 2.6   bow of i: 1.1   tail of i: 4.1   gama_i0: 33.0   gama_i1: 35.
0      duration_time_i: 2.0   demand_i: 120.0   work load_i: 120.0   work load gap_i: 0
135 V_id: 15  li: 8.0   xi: 14.5   bow of i: 10.5   tail of i: 18.5   gama_i0: 3.0   gama_i1
: 6.0   duration_time_i: 3.0   demand_i: 100.0   work load_i: 100.0   work load gap_i: 0
136 V_id: 16  li: 8.0   xi: 6.1   bow of i: 2.1   tail of i: 10.1   gama_i0: 0.0   gama_i1: 1
.0   duration_time_i: 1.0   demand_i: 80.0   work load_i: 80.0   work load gap_i: 0
137 V_id: 17  li: 6.0   xi: 13.5   bow of i: 10.5   tail of i: 16.5   gama_i0: 1.0   gama_i1
: 3.0   duration_time_i: 2.0   demand_i: 120.0   work load_i: 120.0   work load gap_i: 0
138 V_id: 18  li: 5.0   xi: 13.0   bow of i: 10.5   tail of i: 15.5   gama_i0: 6.0   gama_i1
: 9.0   duration_time_i: 3.0   demand_i: 160.0   work load_i: 160.0   work load gap_i: 0
139
140 Algorithm finished and the total CPU time: 1328 s
141 End
142

```