```
 1  "E:\1 □□□□\3 □□□□□\1 □□□□□□□\1 □□□□□□□□□\1_□□□□□□_□□□□\1_LW_□□□□2\6 □□□□\2 python code\01_My_Python_Code\Scripts\python.
    exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=50790
 2
 3  import sys; print('Python %s on %s' % (sys.version, sys.platform))
 4  sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□□\\1 □□□□□□□□□\\1_□□□□□□_□□□□\\1_LW_□□□□2\\6 □□□□\\2 python code\\
    01_My_Python_Code', 'E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2 python code/
    01_My_Python_Code'])
 5
 6  PyDev console: starting.
 7
 8  Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
 9  >>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2 python code/01_My_Python_Code/
    main_BACASP_official_ENSGA-II.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW_□□□□2/6 □□□□/2
    python code/01_My_Python_Code')
10  Backend TkAgg is interactive backend. Turning interactive mode on.
11  Waiting 1s.....
12
13  This is the  R_20_9 _standerd_test.xlsx  optimization process solved by ENSGA-II algorithm.
14
15  Start
16
17  Before iteration:
18      Read basic data
19      Parameter setting:
20          trail =  58
21          Pop_size =  30
22          Tolerance_iteration_unchanged_number =  10
23          Chrom_size =  60
24          Iter_num_GA =  300
25          Select_rate =  0.85
26          Crossover_rate =  0.95
27          Mutation rate =  0.95
28          Mu_oper_type =  1
29          vessel_move_way =  2
30          coefficient for Obj1=  1.9
31          coefficient for Obj2=  0.10000000000000009
32          gen =  0
33
34  Iteration begin:
35  Beging the No. 0  iteration:
36      obj[0] = 166.50    temp_best_value_gen = 166.50
37      The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40      obj[gen-1] = 166.50     temp_best_value_gen = 166.50
41      No, maintain solution  and obj[gen] = 166.50 , and the tolerance_counter = 1
42      solution chromosome =
43        first level: [ [ 3.5  9.  12.5 17.5 23.  25.5  4.5  4.5  2.5  3.   4.   4.5  4.5  2.5
44    2.5  4.   4.   2.   3.5  3.5]
45          second level:  [ 2.  6. 10.  1.  3.  0. 12.  1.  7.  4. 10.  0. 15. 16. 18. 20. 21. 23.
46    25.  6.]
47          third level:  [2. 2. 2. 4. 1. 3. 2. 8. 3. 4. 5. 6. 3. 4. 2. 7. 3. 3. 3. 5.] ]
48      The No. 1  iteration is finished!
49
50  Beging the No. 2  iteration:
51      obj[gen-1] = 166.50     temp_best_value_gen = 166.50
52      No, maintain solution  and obj[gen] = 166.50 , and the tolerance_counter = 2
53      solution chromosome =
54        first level: [ [ 3.5  9.  12.5 17.5 23.  25.5  4.5  4.5  2.5  3.   4.   4.5  4.5  2.5
55    2.5  4.   4.   2.   3.5  3.5]
56          second level:  [ 2.  6. 10.  1.  3.  0. 12.  1.  7.  4. 10.  0. 15. 16. 18. 20. 21. 23.
57    25.  6.]
58          third level:  [2. 2. 2. 4. 1. 3. 2. 8. 3. 4. 5. 6. 3. 4. 2. 7. 3. 3. 3. 5.] ]
59      The No. 2  iteration is finished!
60
61  Beging the No. 3  iteration:
62      obj[gen-1] = 166.50     temp_best_value_gen = 166.50
63      No, maintain solution  and obj[gen] = 166.50 , and the tolerance_counter = 3
64      solution chromosome =
65        first level: [ [ 3.5  9.  12.5 17.5 23.  25.5  4.5  4.5  2.5  3.   4.   4.5  4.5  2.5
66    2.5  4.   4.   2.   3.5  3.5]
67          second level:  [ 2.  6. 10.  1.  3.  0. 12.  1.  7.  4. 10.  0. 15. 16. 18. 20. 21. 23.
68    25.  6.]
69          third level:  [2. 2. 2. 4. 1. 3. 2. 8. 3. 4. 5. 6. 3. 4. 2. 7. 3. 3. 3. 5.] ]
70      The No. 3  iteration is finished!
71
72  Beging the No. 4  iteration:
73      obj[gen-1] = 166.50     temp_best_value_gen = 166.50
74      No, maintain solution  and obj[gen] = 166.50 , and the tolerance_counter = 4
75      solution chromosome =
76        first level: [ [ 3.5  9.  12.5 17.5 23.  25.5  4.5  4.5  2.5  3.   4.   4.5  4.5  2.5
77    2.5  4.   4.   2.   3.5  3.5]
78          second level:  [ 2.  6. 10.  1.  3.  0. 12.  1.  7.  4. 10.  0. 15. 16. 18. 20. 21. 23.
79    25.  6.]
```

```
 80      third level: [2. 2. 2. 4. 1. 3. 2. 8. 3. 4. 5. 6. 3. 4. 2. 7. 3. 3. 3. 5.] ]
 81    The No. 4  iteration is finished!
 82
 83  Beging the No. 5  iteration:
 84    obj[gen-1] = 166.50    temp_best_value_gen = 166.50
 85    No, maintain solution  and obj[gen] = 166.50 , and the tolerance_counter = 5
 86    solution chromosome =
 87      first level: [ [ 3.5  9.  12.5 17.5 23.  25.5  4.5  4.5  2.5  3.   4.   4.5  4.5  2.5
 88   2.5  4.   4.   2.   3.5  3.5]
 89      second level:  [ 2.  6. 10.  1.  3.  0. 12.  1.  7.  4. 10.  0. 15. 16. 18. 20. 21. 23.
 90   25.  6.]
 91      third level: [2. 2. 2. 4. 1. 3. 2. 8. 3. 4. 5. 6. 3. 4. 2. 7. 3. 3. 3. 5.] ]
 92    The No. 5  iteration is finished!
 93
 94  Beging the No. 6  iteration:
 95    obj[gen-1] = 166.50    temp_best_value_gen = 166.50
 96    No, maintain solution  and obj[gen] = 166.50 , and the tolerance_counter = 6
 97    solution chromosome =
 98      first level: [ [ 3.5  9.  12.5 17.5 23.  25.5  4.5  4.5  2.5  3.   4.   4.5  4.5  2.5
 99   2.5  4.   4.   2.   3.5  3.5]
100      second level:  [ 2.  6. 10.  1.  3.  0. 12.  1.  7.  4. 10.  0. 15. 16. 18. 20. 21. 23.
101   25.  6.]
102      third level: [2. 2. 2. 4. 1. 3. 2. 8. 3. 4. 5. 6. 3. 4. 2. 7. 3. 3. 3. 5.] ]
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: [ [ 3.5  9.  12.5 17.5 23.  25.5  4.5  4.5  2.5  3.   4.   4.5  4.5  2.5
110   2.5  4.   4.   2.   3.5  3.5]
111      second level:  [ 2.  6. 10.  1.  3.  0. 12.  1.  7.  4. 10.  0. 15. 16. 18. 20. 21. 23.
112   25.  6.]
113      third level: [2. 2. 2. 4. 1. 3. 2. 8. 3. 4. 5. 6. 3. 4. 2. 7. 3. 3. 3. 5.] ]
114    Objective function values and some other indicators:
115      Obj0 = 26.00          Obj1 = 1171.00          Obj0 + Obj1 = 1197.00
116      Total movement of crane: 26.00
117      Total waiting time in berth position: 200.00
118      Total index of q during berthing: 465.00
119    Specific arrangement for each vessel:
```

120	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: 4.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
121	V_id: 1	li: 4.0	xi: 9.0	bow of i: 7.0	tail of i: 11.0	gama_i0: 6.0	gama_i1: 10.0
		duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
122	V_id: 2	li: 3.0	xi: 12.5	bow of i: 11.0	tail of i: 14.0	gama_i0: 10.0	gama_i1: 13.0
		duration_time_i: 3.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
123	V_id: 3	li: 7.0	xi: 17.5	bow of i: 14.0	tail of i: 21.0	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		
124	V_id: 4	li: 4.0	xi: 23.0	bow of i: 21.0	tail of i: 25.0	gama_i0: 3.0	gama_i1: 6.0
		duration_time_i: 3.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
125	V_id: 5	li: 9.0	xi: 25.5	bow of i: 21.0	tail of i: 30.0	gama_i0: 0.0	gama_i1: 3.0
		duration_time_i: 3.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
126	V_id: 6	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 12.0	gama_i1: 15.0
		duration_time_i: 3.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
127	V_id: 7	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 1.0	gama_i1: 2.0
		duration_time_i: 1.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
128	V_id: 8	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 7.0	gama_i1: 10.0
		duration_time_i: 3.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
129	V_id: 9	li: 6.0	xi: 3.0	bow of i: 0.0	tail of i: 6.0	gama_i0: 4.0	gama_i1: 6.0
		duration_time_i: 2.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
130	V_id: 10	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 10.0	gama_i1: 12.0
		duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0		
131	V_id: 11	li: 8.0	xi: 4.5	bow of i: 0.5	tail of i: 8.5	gama_i0: 0.0	gama_i1: 1.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
132	V_id: 12	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 15.0	gama_i1: 16.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
133	V_id: 13	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 16.0	gama_i1: 18.0
		duration_time_i: 2.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0		
134	V_id: 14	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 18.0	gama_i1: 20.0
		duration_time_i: 2.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		
135	V_id: 15	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 20.0	gama_i1: 21.0
		duration_time_i: 1.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0		
136	V_id: 16	li: 8.0	xi: 4.0	bow of i: 0.0	tail of i: 8.0	gama_i0: 21.0	gama_i1: 23.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
137	V_id: 17	li: 4.0	xi: 2.0	bow of i: 0.0	tail of i: 4.0	gama_i0: 23.0	gama_i1: 25.0
		duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0		
138	V_id: 18	li: 7.0	xi: 3.5	bow of i: 0.0	tail of i: 7.0	gama_i0: 25.0	gama_i1: 27.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0		
139	V_id: 19	li: 7.0	xi: 3.5	bow of i: 0.0	tail of i: 7.0	gama_i0: 6.0	gama_i1: 7.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0		

```
140
141  Algorithm finished and the total CPU time: 1410 s
142  End
143
```