```
 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=52999
 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_17_8 _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 =  51
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] = 87.50     temp_best_value_gen = 87.50
37      The No. 0  iteration is finished!
38
39  Beging the No. 1  iteration:
40      obj[gen-1] = 87.50   temp_best_value_gen = 87.50
41      No, maintain solution  and obj[gen] = 87.50 , and the tolerance_counter = 1
42      solution chromosome =
43         first level: [ [ 2.   8.  16.5 22.5 25.5 3.   1.5 3.   4.5 2.5 1.5 3.   2.5 4.5
44    3.5  3.5  2. ]
45         second level:  [ 1.  4.  3.  4.  2.  7. 10.  5. 14. 15. 17. 19. 21. 25. 27. 28. 30.]
46         third level:  [2. 4. 2. 1. 4. 3. 2. 4. 8. 4. 3. 2. 2. 5. 5. 4. 1.] ]
47      The No. 1  iteration is finished!
48
49  Beging the No. 2  iteration:
50      obj[gen-1] = 87.50   temp_best_value_gen = 86.10
51      Yes, update solution and obj[gen] = 86.10
52      solution chromosome =
53         first level: [ [ 2.   8.   4.5 22.5 25.5 3.   1.5 3.   4.5 2.5 1.5 3.   2.5 4.5
54    3.5  3.5 16.5]
55         second level:  [ 1.  4. 30.  4.  2.  7. 10.  5. 14. 15. 17. 19. 21. 25. 27. 28.  3.]
56         third level:  [2. 4. 2. 1. 4. 3. 2. 4. 8. 4. 3. 2. 2. 5. 5. 4. 2.] ]
57      The No. 2  iteration is finished!
58
59  Beging the No. 3  iteration:
60      obj[gen-1] = 86.10   temp_best_value_gen = 80.60
61      Yes, update solution and obj[gen] = 80.60
62      solution chromosome =
63         first level: [ [ 2.   8.   4.5 22.5 25.5 3.   1.5 3.   4.5 2.5 1.5 3.   2.5 4.5
64    3.5  3.5 16.5]
65         second level:  [ 1.  4.  6.  8. 10. 12. 14.  8.  5. 10. 18. 20. 22. 26. 28. 29.  3.]
66         third level:  [2. 4. 5. 3. 3. 4. 2. 4. 8. 4. 3. 2. 2. 5. 5. 4. 2.] ]
67      The No. 3  iteration is finished!
68
69  Beging the No. 4  iteration:
70      obj[gen-1] = 80.60   temp_best_value_gen = 80.60
71      No, maintain solution  and obj[gen] = 80.60 , and the tolerance_counter = 1
72      solution chromosome =
73         first level: [ [ 2.   8.   4.5 22.5 25.5 3.   1.5 3.   4.5 2.5 1.5 3.   2.5 4.5
74    3.5  3.5 16.5]
75         second level:  [ 1.  4.  6.  8. 10. 12. 14.  8.  5. 10. 18. 20. 22. 26. 28. 29.  3.]
76         third level:  [2. 4. 5. 3. 3. 4. 2. 4. 8. 4. 3. 2. 2. 5. 5. 4. 2.] ]
77      The No. 4  iteration is finished!
78
79  Beging the No. 5  iteration:
```

```
 80    obj[gen-1] = 80.60   temp_best_value_gen = 80.60
 81    No, maintain solution  and obj[gen] = 80.60 , and the tolerance_counter = 2
 82    solution chromosome =
 83      first level: [ [ 2.   8.   4.5 22.5 25.5 3.   1.5 3.   4.5 2.5 1.5 3.   2.5 4.5
 84   3.5  3.5 16.5]
 85      second level:  [ 1.  4.  6.  8. 10. 12. 14.  8.  5. 10. 18. 20. 22. 26. 28. 29.  3.]
 86      third level:  [2. 4. 5. 3. 3. 4. 2. 4. 8. 4. 3. 2. 2. 5. 5. 4. 2.] ]
 87    The No. 5  iteration is finished!
 88
 89  Beging the No. 6  iteration:
 90    obj[gen-1] = 80.60   temp_best_value_gen = 80.60
 91    No, maintain solution  and obj[gen] = 80.60 , and the tolerance_counter = 3
 92    solution chromosome =
 93      first level: [ [ 2.   8.   4.5 22.5 25.5 3.   1.5 3.   4.5 2.5 1.5 3.   2.5 4.5
 94   3.5  3.5 16.5]
 95      second level:  [ 1.  4.  6.  8. 10. 12. 14.  8.  5. 10. 18. 20. 22. 26. 28. 29.  3.]
 96      third level:  [2. 4. 5. 3. 3. 4. 2. 4. 8. 4. 3. 2. 2. 5. 5. 4. 2.] ]
 97    The No. 6  iteration is finished!
 98
 99  Beging the No. 7  iteration:
100    obj[gen-1] = 80.60   temp_best_value_gen = 80.60
101    No, maintain solution  and obj[gen] = 80.60 , and the tolerance_counter = 4
102    solution chromosome =
103      first level: [ [ 2.   8.   4.5 22.5 25.5 3.   1.5 3.   4.5 2.5 1.5 3.   2.5 4.5
104   3.5  3.5 16.5]
105      second level:  [ 1.  4.  6.  8. 10. 12. 14.  8.  5. 10. 18. 20. 22. 26. 28. 29.  3.]
106      third level:  [2. 4. 5. 3. 3. 4. 2. 4. 8. 4. 3. 2. 2. 5. 5. 4. 2.] ]
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: [ [ 2.   8.   4.5 22.5 25.5 3.   1.5 3.   4.5 2.5 1.5 3.   2.5 4.5
114   3.5  3.5 16.5]
115      second level:  [ 1.  4.  6.  8. 10. 12. 14.  8.  5. 10. 18. 20. 22. 26. 28. 29.  3.]
116      third level:  [2. 4. 5. 3. 3. 4. 2. 4. 8. 4. 3. 2. 2. 5. 5. 4. 2.] ]
117    Objective function values and some other indicators:
118      Obj0 = 30.00          Obj1 = 236.00          Obj0 + Obj1 = 266.00
119      Total movement of crane: 12.00
120      Total waiting time in berth position: 224.00
121      Total index of q during berthing: 340.00
122      Specific arrangement for each vessel:
```

123	V_id: 0	li: 4.0	xi: 2.0	bow of i: 0.0	tail of i: 4.0	gama_i0: 1.0	gama_i1: 4.0
		duration_time_i: 3.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0	
124	V_id: 1	li: 8.0	xi: 8.0	bow of i: 4.0	tail of i: 12.0	gama_i0: 4.0	gama_i1: 5.0
		duration_time_i: 1.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
125	V_id: 2	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 6.0	gama_i1: 8.0
		duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0	
126	V_id: 3	li: 3.0	xi: 22.5	bow of i: 21.0	tail of i: 24.0	gama_i0: 8.0	gama_i1: 10.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
127	V_id: 4	li: 9.0	xi: 25.5	bow of i: 21.0	tail of i: 30.0	gama_i0: 10.0	gama_i1: 12.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
128	V_id: 5	li: 6.0	xi: 3.0	bow of i: 0.0	tail of i: 6.0	gama_i0: 12.0	gama_i1: 14.0
		duration_time_i: 2.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0	
129	V_id: 6	li: 3.0	xi: 1.5	bow of i: 0.0	tail of i: 3.0	gama_i0: 14.0	gama_i1: 18.0
		duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0	
130	V_id: 7	li: 6.0	xi: 3.0	bow of i: 0.0	tail of i: 6.0	gama_i0: 8.0	gama_i1: 10.0
		duration_time_i: 2.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0	
131	V_id: 8	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 5.0	gama_i1: 6.0
		duration_time_i: 1.0	demand_i: 140.0	work load_i: 140.0	work load gap_i: 0	
132	V_id: 9	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	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	
133	V_id: 10	li: 3.0	xi: 1.5	bow of i: 0.0	tail of i: 3.0	gama_i0: 18.0	gama_i1: 20.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	
134	V_id: 11	li: 6.0	xi: 3.0	bow of i: 0.0	tail of i: 6.0	gama_i0: 20.0	gama_i1: 22.0
		duration_time_i: 2.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0	
135	V_id: 12	li: 5.0	xi: 2.5	bow of i: 0.0	tail of i: 5.0	gama_i0: 22.0	gama_i1: 26.0
		duration_time_i: 4.0	demand_i: 160.0	work load_i: 160.0	work load gap_i: 0	
136	V_id: 13	li: 9.0	xi: 4.5	bow of i: 0.0	tail of i: 9.0	gama_i0: 26.0	gama_i1: 28.0
		duration_time_i: 2.0	demand_i: 120.0	work load_i: 120.0	work load gap_i: 0	
137	V_id: 14	li: 7.0	xi: 3.5	bow of i: 0.0	tail of i: 7.0	gama_i0: 28.0	gama_i1: 29.0
		duration_time_i: 1.0	demand_i: 60.0	work load_i: 60.0	work load gap_i: 0	
138	V_id: 15	li: 7.0	xi: 3.5	bow of i: 0.0	tail of i: 7.0	gama_i0: 29.0	gama_i1: 31.0
		duration_time_i: 2.0	demand_i: 100.0	work load_i: 100.0	work load gap_i: 0	
139	V_id: 16	li: 4.0	xi: 16.5	bow of i: 14.5	tail of i: 18.5	gama_i0: 3.0	gama_i1: 5.0
		duration_time_i: 2.0	demand_i: 80.0	work load_i: 80.0	work load gap_i: 0	

```
140
141  Algorithm finished and the total CPU time: 1342 s
142  End
143
```