```
"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=43395

import sys; print('Python %s on %s' % (sys.version, sys.platform))
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'])

PyDev console: starting.

Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
>>> 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')
Backend TkAgg is interactive backend. Turning interactive mode on.
Waiting 1s.....

This is the  R_18_5 _standerd_test.xlsx  optimization process solved by ENSGA-II algorithm.

Start

Before iteration:
    Read basic data
    Parameter setting:
        trail =  58
        Pop_size =  30
        Tolerance_iteration_unchanged_number =  10
        Chrom_size =  54
        Iter_num_GA =  300
        Select_rate =  0.85
        Crossover_rate =  0.95
        Mutation rate =  0.95
        Mu_oper_type =  1
        vessel_move_way =  2
        coefficient for Obj1=  1.9
        coefficient for Obj2=  0.10000000000000009
        gen =  0

Iteration begin:
Beging the No. 0  iteration:
    obj[0] = 89.25      temp_best_value_gen = 89.25
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 89.25   temp_best_value_gen = 89.25
    No, maintain solution  and obj[gen] = 89.25 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 4.13  3.69  1.51  1.98  4.16  1.7   3.58  7.19  3.58  6.88  2.56  4.03
  9.    9.    9.5  11.    8.5   9.5 ]
        second level:  [ 3. 15.  1.  5. 10. 12. 19. 23. 27.  1. 31.  7.  2.  4.  7. 12. 28. 16.]
        third level:  [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 89.25   temp_best_value_gen = 89.25
    No, maintain solution  and obj[gen] = 89.25 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 4.13  3.69  1.51  1.98  4.16  1.7   3.58  7.19  3.58  6.88  2.56  4.03
  9.    9.    9.5  11.    8.5   9.5 ]
        second level:  [ 3. 15.  1.  5. 10. 12. 19. 23. 27.  1. 31.  7.  2.  4.  7. 12. 28. 16.]
        third level:  [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 89.25   temp_best_value_gen = 89.25
    No, maintain solution  and obj[gen] = 89.25 , and the tolerance_counter = 3
    solution chromosome =
        first level: [ [ 4.13  3.69  1.51  1.98  4.16  1.7   3.58  7.19  3.58  6.88  2.56  4.03
  9.    9.    9.5  11.    8.5   9.5 ]
        second level:  [ 3. 15.  1.  5. 10. 12. 19. 23. 27.  1. 31.  7.  2.  4.  7. 12. 28. 16.]
        third level:  [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 89.25   temp_best_value_gen = 89.25
    No, maintain solution  and obj[gen] = 89.25 , and the tolerance_counter = 4
    solution chromosome =
        first level: [ [ 4.13  3.69  1.51  1.98  4.16  1.7   3.58  7.19  3.58  6.88  2.56  4.03
  9.    9.    9.5  11.    8.5   9.5 ]
        second level:  [ 3. 15.  1.  5. 10. 12. 19. 23. 27.  1. 31.  7.  2.  4.  7. 12. 28. 16.]
        third level:  [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.] ]
    The No. 4  iteration is finished!

Beging the No. 5  iteration:
```

```
  obj[gen-1] = 89.25   temp_best_value_gen = 89.25
  No, maintain solution  and obj[gen] = 89.25 , and the tolerance_counter = 5
  solution chromosome =
     first level: [ [ 4.13  3.69  1.51  1.98  4.16  1.7   3.58  7.19  3.58  6.88  2.56  4.03
 9.   9.   9.5  11.   8.5   9.5 ]
     second level:  [ 3. 15.  1.  5. 10. 12. 19. 23. 27.  1. 31.  7.  2.  4.  7. 12. 28. 16.]
     third level:  [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.] ]
  The No. 5  iteration is finished!

Beging the No. 6  iteration:
  obj[gen-1] = 89.25   temp_best_value_gen = 89.25
  No, maintain solution  and obj[gen] = 89.25 , and the tolerance_counter = 6
  solution chromosome =
     first level: [ [ 4.13  3.69  1.51  1.98  4.16  1.7   3.58  7.19  3.58  6.88  2.56  4.03
 9.   9.   9.5  11.   8.5   9.5 ]
     second level:  [ 3. 15.  1.  5. 10. 12. 19. 23. 27.  1. 31.  7.  2.  4.  7. 12. 28. 16.]
     third level:  [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.] ]
  The No. 6  iteration is finished!


----------------------------------------------------------------------------
The iteration is terminated and then visulize the solution:
  solution chromosome =
     first level: [ [ 4.13  3.69  1.51  1.98  4.16  1.7   3.58  7.19  3.58  6.88  2.56  4.03
 9.   9.   9.5  11.   8.5   9.5 ]
     second level:  [ 3. 15.  1.  5. 10. 12. 19. 23. 27.  1. 31.  7.  2.  4.  7. 12. 28. 16.]
     third level:  [3. 2. 3. 2. 4. 3. 2. 2. 2. 7. 2. 3. 3. 2. 3. 2. 2. 4.] ]
  Objective function values and some other indicators:
     Obj0 = 34.00          Obj1 = 246.54          Obj0 + Obj1 = 280.54
     Total movement of crane: 23.54
     Total waiting time in berth position: 223.00
     Total index of q during berthing: 389.00
  Specific arrangement for each vessel:
     V_id:  0          li: 5.0          xi: 4.1          bow of i: 1.6          tail of i: 6.6          gama_i0: 3.0          gama_i1: 5.0
                duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
     V_id:  1          li: 5.0          xi: 3.7          bow of i: 1.2          tail of i: 6.2          gama_i0: 15.0          gama_i1: 19.0
                duration_time_i: 4.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
     V_id:  2          li: 3.0          xi: 1.5          bow of i: 0.0          tail of i: 3.0          gama_i0: 1.0          gama_i1: 3.0
                duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
     V_id:  3          li: 3.0          xi: 2.0          bow of i: 0.5          tail of i: 3.5          gama_i0: 5.0          gama_i1: 7.0
                duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
     V_id:  4          li: 7.0          xi: 4.2          bow of i: 0.7          tail of i: 7.7          gama_i0: 10.0          gama_i1: 12.0
                duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
     V_id:  5          li: 3.0          xi: 1.7          bow of i: 0.2          tail of i: 3.2          gama_i0: 12.0          gama_i1: 15.0
                duration_time_i: 3.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
     V_id:  6          li: 7.0          xi: 3.6          bow of i: 0.1          tail of i: 7.1          gama_i0: 19.0          gama_i1: 23.0
                duration_time_i: 4.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
     V_id:  7          li: 9.0          xi: 7.2          bow of i: 2.7          tail of i: 11.7          gama_i0: 23.0          gama_i1: 27.
0                duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
     V_id:  8          li: 6.0          xi: 3.6          bow of i: 0.6          tail of i: 6.6          gama_i0: 27.0          gama_i1: 31.0
                duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
     V_id:  9          li: 7.0          xi: 6.9          bow of i: 3.4          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
     V_id:  10          li: 3.0          xi: 2.6          bow of i: 1.1          tail of i: 4.1          gama_i0: 31.0          gama_i1: 35.
0                duration_time_i: 4.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
     V_id:  11          li: 5.0          xi: 4.0          bow of i: 1.5          tail of i: 6.5          gama_i0: 7.0          gama_i1: 10.
0                duration_time_i: 3.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
     V_id:  12          li: 4.0          xi: 9.0          bow of i: 7.0          tail of i: 11.0          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
     V_id:  13          li: 4.0          xi: 9.0          bow of i: 7.0          tail of i: 11.0          gama_i0: 4.0          gama_i1: 7
.0          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
     V_id:  14          li: 5.0          xi: 9.5          bow of i: 7.0          tail of i: 12.0          gama_i0: 7.0          gama_i1:
10.0          duration_time_i: 3.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
     V_id:  15          li: 8.0          xi: 11.0          bow of i: 7.0          tail of i: 15.0          gama_i0: 12.0          gama_i1
: 16.0          duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
     V_id:  16          li: 3.0          xi: 8.5          bow of i: 7.0          tail of i: 10.0          gama_i0: 28.0          gama_i1:
32.0          duration_time_i: 4.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
     V_id:  17          li: 5.0          xi: 9.5          bow of i: 7.0          tail of i: 12.0          gama_i0: 16.0          gama_i1:
18.0          duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0

Algorithm finished and the total CPU time: 1229 s
End
```