```
"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=52493

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_7_3 _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 =  21
        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] = 21.30      temp_best_value_gen = 21.30
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 21.30   temp_best_value_gen = 21.30
    No, maintain solution  and obj[gen] = 21.30 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 1.5  6.  13.  19.5 25.5  1.5  3. ]
        second level:  [4. 5. 2. 7. 1. 1. 3.]
        third level:  [2. 4. 8. 2. 2. 3. 4.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 21.30   temp_best_value_gen = 21.30
    No, maintain solution  and obj[gen] = 21.30 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 1.5  6.  13.  19.5 25.5  1.5  3. ]
        second level:  [4. 5. 2. 7. 1. 1. 3.]
        third level:  [2. 4. 8. 2. 2. 3. 4.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 21.30   temp_best_value_gen = 19.80
    Yes, update solution and obj[gen] = 19.80
    solution chromosome =
        first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
        second level:  [4. 5. 2. 1. 1. 7. 7.]
        third level:  [2. 4. 8. 3. 2. 2. 4.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
        second level:  [4. 5. 2. 1. 1. 7. 7.]
        third level:  [2. 4. 8. 3. 2. 2. 4.] ]
    The No. 4  iteration is finished!

Beging the No. 5  iteration:
    obj[gen-1] = 19.80   temp_best_value_gen = 19.80
    No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
```

```
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 5  iteration is finished!

Beging the No. 6  iteration:
   obj[gen-1] = 19.80   temp_best_value_gen = 19.80
   No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 3
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 6  iteration is finished!

Beging the No. 7  iteration:
   obj[gen-1] = 19.80   temp_best_value_gen = 19.80
   No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 4
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 7  iteration is finished!

Beging the No. 8  iteration:
   obj[gen-1] = 19.80   temp_best_value_gen = 19.80
   No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 5
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 8  iteration is finished!

Beging the No. 9  iteration:
   obj[gen-1] = 19.80   temp_best_value_gen = 19.80
   No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 6
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 9  iteration is finished!

Beging the No. 10  iteration:
   obj[gen-1] = 19.80   temp_best_value_gen = 19.80
   No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 7
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 10  iteration is finished!

Beging the No. 11  iteration:
   obj[gen-1] = 19.80   temp_best_value_gen = 19.80
   No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 8
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 11  iteration is finished!

Beging the No. 12  iteration:
   obj[gen-1] = 19.80   temp_best_value_gen = 19.80
   No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 9
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 12  iteration is finished!

Beging the No. 13  iteration:
   obj[gen-1] = 19.80   temp_best_value_gen = 19.80
   No, maintain solution  and obj[gen] = 19.80 , and the tolerance_counter = 10
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   The No. 13  iteration is finished!


--------------------------------------------------------------------------------
The iteration is terminated and then visulize the solution:
   solution chromosome =
      first level: [ [ 1.5  6.  13.   2.5 25.5 19.5  3. ]
      second level:  [4. 5. 2. 1. 1. 7. 7.]
      third level:  [2. 4. 8. 3. 2. 2. 4.] ]
   Objective function values and some other indicators:
```

```
Obj0 = 9.00          Obj1 = 27.00          Obj0 + Obj1 = 36.00
Total movement of crane: 0.00
Total waiting time in berth position: 27.00
Total index of q during berthing: 349.00
Specific arrangement for each vessel:
V_id:  0    li: 3.0    xi: 1.5    bow of i: 0.0    tail of i: 3.0    gama_i0: 4.0    gama_i1: 7.0    duration_time_i: 3.0    demand_i: 100.0    work load_i: 100.0    work load gap_i: 0
V_id:  1    li: 6.0    xi: 6.0    bow of i: 3.0    tail of i: 9.0    gama_i0: 5.0    gama_i1: 7.0    duration_time_i: 2.0    demand_i: 100.0    work load_i: 100.0    work load gap_i: 0
V_id:  2    li: 8.0    xi: 13.0    bow of i: 9.0    tail of i: 17.0    gama_i0: 2.0    gama_i1: 3.0    duration_time_i: 1.0    demand_i: 60.0    work load_i: 60.0    work load gap_i: 0
V_id:  3    li: 5.0    xi: 2.5    bow of i: 0.0    tail of i: 5.0    gama_i0: 1.0    gama_i1: 4.0    duration_time_i: 3.0    demand_i: 160.0    work load_i: 160.0    work load gap_i: 0
V_id:  4    li: 9.0    xi: 25.5    bow of i: 21.0    tail of i: 30.0    gama_i0: 1.0    gama_i1: 5.0    duration_time_i: 4.0    demand_i: 160.0    work load_i: 160.0    work load gap_i: 0
V_id:  5    li: 3.0    xi: 19.5    bow of i: 18.0    tail of i: 21.0    gama_i0: 7.0    gama_i1: 10.0    duration_time_i: 3.0    demand_i: 120.0    work load_i: 120.0    work load gap_i: 0
V_id:  6    li: 6.0    xi: 3.0    bow of i: 0.0    tail of i: 6.0    gama_i0: 7.0    gama_i1: 8.0    duration_time_i: 1.0    demand_i: 80.0    work load_i: 80.0    work load gap_i: 0

Algorithm finished and the total CPU time: 1103 s
End
```