```
"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=50610

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_6_6 _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 =  18
        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] = 16.40      temp_best_value_gen = 16.40
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 16.40   temp_best_value_gen = 16.00
    Yes, update solution and obj[gen] = 16.00
    solution chromosome =
        first level: [ [ 4.  10.5 26.  23.5 17.   4. ]
        second level:  [1. 2. 3. 5. 4. 0.]
        third level:  [8. 4. 6. 3. 6. 6.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 16.00   temp_best_value_gen = 16.00
    No, maintain solution  and obj[gen] = 16.00 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 4.  10.5 26.  23.5 17.   4. ]
        second level:  [1. 2. 3. 5. 4. 0.]
        third level:  [8. 4. 6. 3. 6. 6.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 16.00   temp_best_value_gen = 16.00
    No, maintain solution  and obj[gen] = 16.00 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 4.  10.5 26.  23.5 17.   4. ]
        second level:  [1. 2. 3. 5. 4. 0.]
        third level:  [8. 4. 6. 3. 6. 6.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 16.00   temp_best_value_gen = 12.80
    Yes, update solution and obj[gen] = 12.80
    solution chromosome =
        first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
        second level:  [2. 3. 0. 3. 0. 1.]
        third level:  [5. 2. 6. 3. 6. 5.] ]
    The No. 4  iteration is finished!

Beging the No. 5  iteration:
    obj[gen-1] = 12.80   temp_best_value_gen = 12.80
    No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
```

```
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 5  iteration is finished!

Beging the No. 6  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 2
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 6  iteration is finished!

Beging the No. 7  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 3
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 7  iteration is finished!

Beging the No. 8  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 4
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 8  iteration is finished!

Beging the No. 9  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 5
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 9  iteration is finished!

Beging the No. 10  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 6
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 10  iteration is finished!

Beging the No. 11  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 7
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 11  iteration is finished!

Beging the No. 12  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 8
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 12  iteration is finished!

Beging the No. 13  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 9
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 13  iteration is finished!

Beging the No. 14  iteration:
   obj[gen-1] = 12.80   temp_best_value_gen = 12.80
   No, maintain solution  and obj[gen] = 12.80 , and the tolerance_counter = 10
   solution chromosome =
      first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
      second level:  [2. 3. 0. 3. 0. 1.]
      third level:  [5. 2. 6. 3. 6. 5.] ]
   The No. 14  iteration is finished!
```

```
164
165
166 ----------------------------------------------------------------------------------------
167 The iteration is terminated and then visulize the solution:
168     solution chromosome =
169         first level: [ [ 4.  10.5  4.  23.5 17.  26. ]
170         second level:  [2. 3. 0. 3. 0. 1.]
171         third level:  [5. 2. 6. 3. 6. 5.] ]
172     Objective function values and some other indicators:
173         Obj0 = 5.00             Obj1 = 33.00            Obj0 + Obj1 = 38.00
174         Total movement of crane: 24.00
175         Total waiting time in berth position: 9.00
176         Total index of q during berthing: 366.00
177     Specific arrangement for each vessel:
178         V_id:  0            li: 8.0             xi: 4.0             bow of i: 0.0               tail of i: 8.0          gama_i0: 2.0            gama_i1: 3.0
                        duration_time_i: 1.0            demand_i: 100.0             work load_i: 100.0          work load gap_i: 0
179         V_id:  1            li: 5.0             xi: 10.5            bow of i: 8.0               tail of i: 13.0         gama_i0: 3.0            gama_i1: 5
    .0                  duration_time_i: 2.0            demand_i: 60.0              work load_i: 60.0           work load gap_i: 0
180         V_id:  2            li: 8.0             xi: 4.0             bow of i: 0.0               tail of i: 8.0          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
181         V_id:  3            li: 5.0             xi: 23.5            bow of i: 21.0              tail of i: 26.0         gama_i0: 3.0            gama_i1: 6
    .0                  duration_time_i: 3.0            demand_i: 140.0             work load_i: 140.0          work load gap_i: 0
182         V_id:  4            li: 6.0             xi: 17.0            bow of i: 14.0              tail of i: 20.0         gama_i0: 0.0            gama_i1: 1
    .0                  duration_time_i: 1.0            demand_i: 120.0             work load_i: 120.0          work load gap_i: 0
183         V_id:  5            li: 8.0             xi: 26.0            bow of i: 22.0              tail of i: 30.0         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
184
185 Algorithm finished and the total CPU time: 1025 s
186 End
187
```