```
"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=48947

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_20_7 _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 =  60
        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] = 176.18    temp_best_value_gen = 176.18
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 176.18     temp_best_value_gen = 176.18
    No, maintain solution  and obj[gen] = 176.18 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 7.    1.86  3.02  6.3   3.75  2.33  5.62  4.48  7.6   2.08  6.89  2.27
  2.79  6.56  7.71  5.34 16.    1.63 14.5  14.5 ]
        second level:  [ 1.  8.  5. 12. 14. 16. 20. 22.  7.  0. 24. 25. 28. 30. 34. 32.  1.  7.
  2.  4.]
        third level:  [2. 2. 2. 5. 2. 1. 5. 3. 6. 3. 4. 2. 2. 4. 2. 2. 7. 3. 5. 5.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 176.18     temp_best_value_gen = 167.50
    Yes, update solution and obj[gen] = 167.50
    solution chromosome =
        first level: [ [ 4.86  1.79  3.94  5.21  5.57  4.89  6.62  3.96  4.93  2.27  4.61  2.15
  2.7   5.62 10.    8.    6.22  7.5  15.5   9.  ]
        second level:  [14.  1.  4.  7.  6. 10. 18. 22. 24. 25. 26. 27. 30. 32.  1.  2. 12.  3.
  2. 27.]
        third level:  [2. 3. 3. 3. 5. 2. 2. 4. 6. 3. 8. 2. 2. 6. 6. 6. 9. 1. 6. 2.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 167.50     temp_best_value_gen = 167.50
    No, maintain solution  and obj[gen] = 167.50 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 4.86  1.79  3.94  5.21  5.57  4.89  6.62  3.96  4.93  2.27  4.61  2.15
  2.7   5.62 10.    8.    6.22  7.5  15.5   9.  ]
        second level:  [14.  1.  4.  7.  6. 10. 18. 22. 24. 25. 26. 27. 30. 32.  1.  2. 12.  3.
  2. 27.]
        third level:  [2. 3. 3. 3. 5. 2. 2. 4. 6. 3. 8. 2. 2. 6. 6. 6. 9. 1. 6. 2.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 167.50     temp_best_value_gen = 167.50
    No, maintain solution  and obj[gen] = 167.50 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 4.86  1.79  3.94  5.21  5.57  4.89  6.62  3.96  4.93  2.27  4.61  2.15
  2.7   5.62 10.    8.    6.22  7.5  15.5   9.  ]
        second level:  [14.  1.  4.  7.  6. 10. 18. 22. 24. 25. 26. 27. 30. 32.  1.  2. 12.  3.
  2. 27.]
```

```
      third level:  [2. 3. 3. 3. 5. 2. 2. 4. 6. 3. 8. 2. 2. 6. 6. 6. 9. 1. 6. 2.] ]
   The No. 4  iteration is finished!

Beging the No. 5  iteration:
   obj[gen-1] = 167.50     temp_best_value_gen = 167.50
   No, maintain solution  and obj[gen] = 167.50 , and the tolerance_counter = 3
   solution chromosome =
      first level: [ [ 4.86  1.79  3.94  5.21  5.57  4.89  6.62  3.96  4.93  2.27  4.61  2.15
  2.7   5.62 10.    8.    6.22  7.5  15.5   9.  ]
      second level:  [14.  1.  4.  7.  6. 10. 18. 22. 24. 25. 26. 27. 30. 32.  1.  2. 12.  3.
  2. 27.]
      third level:  [2. 3. 3. 3. 5. 2. 2. 4. 6. 3. 8. 2. 2. 6. 6. 6. 9. 1. 6. 2.] ]
   The No. 5  iteration is finished!

Beging the No. 6  iteration:
   obj[gen-1] = 167.50     temp_best_value_gen = 167.50
   No, maintain solution  and obj[gen] = 167.50 , and the tolerance_counter = 4
   solution chromosome =
      first level: [ [ 4.86  1.79  3.94  5.21  5.57  4.89  6.62  3.96  4.93  2.27  4.61  2.15
  2.7   5.62 10.    8.    6.22  7.5  15.5   9.  ]
      second level:  [14.  1.  4.  7.  6. 10. 18. 22. 24. 25. 26. 27. 30. 32.  1.  2. 12.  3.
  2. 27.]
      third level:  [2. 3. 3. 3. 5. 2. 2. 4. 6. 3. 8. 2. 2. 6. 6. 6. 9. 1. 6. 2.] ]
   The No. 6  iteration is finished!


--------------------------------------------------------------------------------
The iteration is terminated and then visulize the solution:
   solution chromosome =
      first level: [ [ 4.86  1.79  3.94  5.21  5.57  4.89  6.62  3.96  4.93  2.27  4.61  2.15
  2.7   5.62 10.    8.    6.22  7.5  15.5   9.  ]
      second level:  [14.  1.  4.  7.  6. 10. 18. 22. 24. 25. 26. 27. 30. 32.  1.  2. 12.  3.
  2. 27.]
      third level:  [2. 3. 3. 3. 5. 2. 2. 4. 6. 3. 8. 2. 2. 6. 6. 6. 9. 1. 6. 2.] ]
   Objective function values and some other indicators:
      Obj0 = 33.00          Obj1 = 1048.04          Obj0 + Obj1 = 1081.04
      Total movement of crane: 44.04
      Total waiting time in berth position: 293.00
      Total index of q during berthing: 374.00
   Specific arrangement for each vessel:
      V_id:  0          li: 9.0          xi: 4.9          bow of i: 0.4          tail of i: 9.4          gama_i0: 14.0          gama_i1: 18.0
                duration_time_i: 4.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
      V_id:  1          li: 3.0          xi: 1.8          bow of i: 0.3          tail of i: 3.3          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:  2          li: 4.0          xi: 3.9          bow of i: 1.9          tail of i: 5.9          gama_i0: 4.0          gama_i1: 6.0
                duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
      V_id:  3          li: 7.0          xi: 5.2          bow of i: 1.7          tail of i: 8.7          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:  4          li: 5.0          xi: 5.6          bow of i: 3.1          tail of i: 8.1          gama_i0: 6.0          gama_i1: 7.0
                duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
      V_id:  5          li: 3.0          xi: 4.9          bow of i: 3.4          tail of i: 6.4          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
      V_id:  6          li: 7.0          xi: 6.6          bow of i: 3.1          tail of i: 10.1          gama_i0: 18.0          gama_i1: 22.
  0             duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
      V_id:  7          li: 7.0          xi: 4.0          bow of i: 0.5          tail of i: 7.5          gama_i0: 22.0          gama_i1: 24.0
                duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
      V_id:  8          li: 8.0          xi: 4.9          bow of i: 0.9          tail of i: 8.9          gama_i0: 24.0          gama_i1: 25.0
                duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
      V_id:  9          li: 3.0          xi: 2.3          bow of i: 0.8          tail of i: 3.8          gama_i0: 25.0          gama_i1: 26.0
                duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
      V_id:  10          li: 8.0          xi: 4.6          bow of i: 0.6          tail of i: 8.6          gama_i0: 26.0          gama_i1: 27.
  0             duration_time_i: 1.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
      V_id:  11          li: 3.0          xi: 2.1          bow of i: 0.6          tail of i: 3.6          gama_i0: 27.0          gama_i1: 30.
  0             duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
      V_id:  12          li: 3.0          xi: 2.7          bow of i: 1.2          tail of i: 4.2          gama_i0: 30.0          gama_i1: 32.
  0             duration_time_i: 2.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
      V_id:  13          li: 8.0          xi: 5.6          bow of i: 1.6          tail of i: 9.6          gama_i0: 32.0          gama_i1: 34.
  0             duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
      V_id:  14          li: 8.0          xi: 10.0          bow of i: 6.0          tail of i: 14.0          gama_i0: 1.0          gama_i1
  : 2.0          duration_time_i: 1.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
      V_id:  15          li: 9.0          xi: 8.0          bow of i: 3.5          tail of i: 12.5          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:  16          li: 9.0          xi: 6.2          bow of i: 1.7          tail of i: 10.7          gama_i0: 12.0          gama_i1:
  13.0          duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
      V_id:  17          li: 3.0          xi: 7.5          bow of i: 6.0          tail of i: 9.0          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
      V_id:  18          li: 6.0          xi: 15.5          bow of i: 12.5          tail of i: 18.5          gama_i0: 2.0          gama_i1
  : 4.0          duration_time_i: 2.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
      V_id:  19          li: 6.0          xi: 9.0          bow of i: 6.0          tail of i: 12.0          gama_i0: 27.0          gama_i1:
  30.0          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0

Algorithm finished and the total CPU time: 1333 s
End
```