```
"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=35303

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_2 _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] = 193.14    temp_best_value_gen = 193.14
    The No. 0  iteration is finished!

Beging the No. 1  iteration:
    obj[gen-1] = 193.14     temp_best_value_gen = 193.14
    No, maintain solution  and obj[gen] = 193.14 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 4.53  6.74  3.66  5.52  3.28  4.2   3.02  3.04  3.85  3.3   2.22  4.86
  2.56  7.8   5.17  2.57 15.   13.5  10.   10.  ]
        second level:  [ 0.  1.  5.  7. 11.  2.  4. 16. 19. 21. 15. 24. 25. 29. 31. 33.  1.  4.
 11. 21.]
        third level:  [5. 5. 3. 2. 2. 5. 3. 2. 3. 2. 4. 6. 2. 5. 4. 2. 6. 2. 2. 2.] ]
    The No. 1  iteration is finished!

Beging the No. 2  iteration:
    obj[gen-1] = 193.14     temp_best_value_gen = 193.14
    No, maintain solution  and obj[gen] = 193.14 , and the tolerance_counter = 2
    solution chromosome =
        first level: [ [ 4.53  6.74  3.66  5.52  3.28  4.2   3.02  3.04  3.85  3.3   2.22  4.86
  2.56  7.8   5.17  2.57 15.   13.5  10.   10.  ]
        second level:  [ 0.  1.  5.  7. 11.  2.  4. 16. 19. 21. 15. 24. 25. 29. 31. 33.  1.  4.
 11. 21.]
        third level:  [5. 5. 3. 2. 2. 5. 3. 2. 3. 2. 4. 6. 2. 5. 4. 2. 6. 2. 2. 2.] ]
    The No. 2  iteration is finished!

Beging the No. 3  iteration:
    obj[gen-1] = 193.14     temp_best_value_gen = 182.55
    Yes, update solution and obj[gen] = 182.55
    solution chromosome =
        first level: [ [ 2.58  8.16  2.37  5.87  3.58  6.87  3.23  4.27  5.4   2.43  2.06  5.77
  2.83  8.56  4.83 15.    6.4   3.46 16.    5.  ]
        second level:  [23.  3.  5.  1.  9. 13. 15. 18. 20. 24.  2. 22. 27.  5. 31.  3. 26. 34.
  6.  0.]
        third level:  [3. 2. 1. 7. 2. 5. 1. 3. 4. 3. 3. 5. 2. 7. 2. 2. 5. 5. 2. 9.] ]
    The No. 3  iteration is finished!

Beging the No. 4  iteration:
    obj[gen-1] = 182.55     temp_best_value_gen = 182.55
    No, maintain solution  and obj[gen] = 182.55 , and the tolerance_counter = 1
    solution chromosome =
        first level: [ [ 2.58  8.16  2.37  5.87  3.58  6.87  3.23  4.27  5.4   2.43  2.06  5.77
  2.83  8.56  4.83 15.    6.4   3.46 16.    5.  ]
        second level:  [23.  3.  5.  1.  9. 13. 15. 18. 20. 24.  2. 22. 27.  5. 31.  3. 26. 34.
  6.  0.]
```

```
      third level:  [3. 2. 1. 7. 2. 5. 1. 3. 4. 3. 3. 5. 2. 7. 2. 2. 5. 5. 2. 9.] ]
   The No. 4  iteration is finished!

Beging the No. 5  iteration:
   obj[gen-1] = 182.55     temp_best_value_gen = 182.55
   No, maintain solution  and obj[gen] = 182.55 , and the tolerance_counter = 2
   solution chromosome =
      first level: [ [ 2.58  8.16  2.37  5.87  3.58  6.87  3.23  4.27  5.4   2.43  2.06  5.77
 2.83  8.56  4.83 15.    6.4   3.46 16.    5.  ]
      second level:  [23.  3.  5.  1.  9. 13. 15. 18. 20. 24.  2. 22. 27.  5. 31.  3. 26. 34.
 6.  0.]
      third level:  [3. 2. 1. 7. 2. 5. 1. 3. 4. 3. 3. 5. 2. 7. 2. 2. 5. 5. 2. 9.] ]
   The No. 5  iteration is finished!

Beging the No. 6  iteration:
   obj[gen-1] = 182.55     temp_best_value_gen = 182.55
   No, maintain solution  and obj[gen] = 182.55 , and the tolerance_counter = 3
   solution chromosome =
      first level: [ [ 2.58  8.16  2.37  5.87  3.58  6.87  3.23  4.27  5.4   2.43  2.06  5.77
 2.83  8.56  4.83 15.    6.4   3.46 16.    5.  ]
      second level:  [23.  3.  5.  1.  9. 13. 15. 18. 20. 24.  2. 22. 27.  5. 31.  3. 26. 34.
 6.  0.]
      third level:  [3. 2. 1. 7. 2. 5. 1. 3. 4. 3. 3. 5. 2. 7. 2. 2. 5. 5. 2. 9.] ]
   The No. 6  iteration is finished!


----------------------------------------------------------------------------------
The iteration is terminated and then visulize the solution:
   solution chromosome =
      first level: [ [ 2.58  8.16  2.37  5.87  3.58  6.87  3.23  4.27  5.4   2.43  2.06  5.77
 2.83  8.56  4.83 15.    6.4   3.46 16.    5.  ]
      second level:  [23.  3.  5.  1.  9. 13. 15. 18. 20. 24.  2. 22. 27.  5. 31.  3. 26. 34.
 6.  0.]
      third level:  [3. 2. 1. 7. 2. 5. 1. 3. 4. 3. 3. 5. 2. 7. 2. 2. 5. 5. 2. 9.] ]
   Objective function values and some other indicators:
      Obj0 = 35.00          Obj1 = 1160.50          Obj0 + Obj1 = 1195.50
      Total movement of crane: 45.50
      Total waiting time in berth position: 287.00
      Total index of q during berthing: 400.00
   Specific arrangement for each vessel:
      V_id:  0          li: 5.0          xi: 2.6          bow of i: 0.1          tail of i: 5.1          gama_i0: 23.0          gama_i1: 24.0
                duration_time_i: 1.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
      V_id:  1          li: 9.0          xi: 8.2          bow of i: 3.7          tail of i: 12.7          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
      V_id:  2          li: 3.0          xi: 2.4          bow of i: 0.9          tail of i: 3.9          gama_i0: 5.0          gama_i1: 9.0
                duration_time_i: 4.0          demand_i: 80.0          work load_i: 80.0          work load gap_i: 0
      V_id:  3          li: 9.0          xi: 5.9          bow of i: 1.4          tail of i: 10.4          gama_i0: 1.0          gama_i1: 2.0
                duration_time_i: 1.0          demand_i: 140.0          work load_i: 140.0          work load gap_i: 0
      V_id:  4          li: 5.0          xi: 3.6          bow of i: 1.1          tail of i: 6.1          gama_i0: 9.0          gama_i1: 13.0
                duration_time_i: 4.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
      V_id:  5          li: 8.0          xi: 6.9          bow of i: 2.9          tail of i: 10.9          gama_i0: 13.0          gama_i1: 15.
0          duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
      V_id:  6          li: 4.0          xi: 3.2          bow of i: 1.2          tail of i: 5.2          gama_i0: 15.0          gama_i1: 18.0
                duration_time_i: 3.0          demand_i: 60.0          work load_i: 60.0          work load gap_i: 0
      V_id:  7          li: 6.0          xi: 4.3          bow of i: 1.3          tail of i: 7.3          gama_i0: 18.0          gama_i1: 20.0
                duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
      V_id:  8          li: 7.0          xi: 5.4          bow of i: 1.9          tail of i: 8.9          gama_i0: 20.0          gama_i1: 22.0
                duration_time_i: 2.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
      V_id:  9          li: 4.0          xi: 2.4          bow of i: 0.4          tail of i: 4.4          gama_i0: 24.0          gama_i1: 26.0
                duration_time_i: 2.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
      V_id:  10          li: 4.0          xi: 2.1          bow of i: 0.1          tail of i: 4.1          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:  11          li: 6.0          xi: 5.8          bow of i: 2.8          tail of i: 8.8          gama_i0: 22.0          gama_i1: 23.
0          duration_time_i: 1.0          demand_i: 100.0          work load_i: 100.0          work load gap_i: 0
      V_id:  12          li: 3.0          xi: 2.8          bow of i: 1.3          tail of i: 4.3          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:  13          li: 9.0          xi: 8.6          bow of i: 4.1          tail of i: 13.1          gama_i0: 5.0          gama_i1: 7
.0          duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
      V_id:  14          li: 6.0          xi: 4.8          bow of i: 1.8          tail of i: 7.8          gama_i0: 31.0          gama_i1: 34.
0          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
      V_id:  15          li: 3.0          xi: 15.0          bow of i: 13.5          tail of i: 16.5          gama_i0: 3.0          gama_i1
: 6.0          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
      V_id:  16          li: 7.0          xi: 6.4          bow of i: 2.9          tail of i: 9.9          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:  17          li: 6.0          xi: 3.5          bow of i: 0.5          tail of i: 6.5          gama_i0: 34.0          gama_i1: 36.
0          duration_time_i: 2.0          demand_i: 160.0          work load_i: 160.0          work load gap_i: 0
      V_id:  18          li: 5.0          xi: 16.0          bow of i: 13.5          tail of i: 18.5          gama_i0: 6.0          gama_i1
: 9.0          duration_time_i: 3.0          demand_i: 120.0          work load_i: 120.0          work load gap_i: 0
      V_id:  19          li: 9.0          xi: 5.0          bow of i: 0.5          tail of i: 9.5          gama_i0: 0.0          gama_i1: 1.0
                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: 1326 s
End
```