```
D:\Python\Python\setroute\python.exe "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=client --port=15519

import sys; print('Python %s on %s' % (sys.version, sys.platform))
sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□□\\1 □□□□□□□□□\\1_□□□□□□_□□□□\\1_LW _□□□□1\\4 □□□□\\3 python_code\\9 Code for this paper', 'E:/1 □□□□/3 □□□□□/1 □□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□1/4 □□□□/3 python_code/9 Code for this paper'])

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 _□□□□1/4 □□□□/3 python_code/9 Code for this paper/main_DM.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□1/4 □□□□/3 python_code/9 Code for this paper')
Backend TkAgg is interactive backend. Turning interactive mode on.
Waiting 5s.....

Optimize the  ./R_9_8.xlsx  instance

Set parameter TimeLimit to value 1200

Set parameter PoolSolutions to value 3
Set parameter PoolGap to value 0.05
Set parameter PoolSearchMode to value 2
Gurobi Optimizer version 11.0.0 build v11.0.0rc2 (win64 - Windows 10.0 (19045.2))

CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
Thread count: 4 physical cores, 8 logical processors, using up to 8 threads

Optimize a model with 213639 rows, 72324 columns and 629811 nonzeros
Model fingerprint: 0xcb277e5f
Variable types: 0 continuous, 72324 integer (60921 binary)
Coefficient statistics:
  Matrix range     [1e+00, 5e+05]
  Objective range  [1e+00, 1e+00]
  Bounds range     [1e+00, 1e+00]
  RHS range        [1e+00, 5e+06]
Presolve removed 183279 rows and 3491 columns
Presolve time: 0.10s
Presolved: 30360 rows, 68833 columns, 90481 nonzeros
Variable types: 0 continuous, 68833 integer (57430 binary)

Root relaxation: objective 4.966452e+02, 2611 iterations, 0.14 seconds (0.20 work units)

    Nodes    |    Current Node    |     Objective Bounds      |     Work
 Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time

     0     0  496.64522    0 1873          -  496.64522      -     -    1s
H    0     0                893.0000000  496.64522  44.4%     -    2s
H    0     0                867.0000000  519.95804  40.0%     -    3s
     0     0  519.95804    0 1876  867.00000  519.95804  40.0%     -    3s
H    0     0                850.0000000  519.96682  38.8%     -    8s
     0     0  543.00000    0 1806  850.00000  543.00000  36.1%     -    8s
     0     0  543.00000    0 1876  850.00000  543.00000  36.1%     -    8s
     0     0  543.00000    0 1536  850.00000  543.00000  36.1%     -    9s
     0     0  544.00000    0 1825  850.00000  544.00000  36.0%     -   10s
     0     0  544.00000    0 1825  850.00000  544.00000  36.0%     -   11s
     0     0  544.00000    0 1622  850.00000  544.00000  36.0%     -   12s
     0     0  544.00000    0 1515  850.00000  544.00000  36.0%     -   12s
     0     2  544.00000    0 1504  850.00000  544.00000  36.0%     -   16s
   485   501  548.09451  105 1506  850.00000  544.00000  36.0%  16.6   20s
  1743  1761  605.79339  351  992  850.00000  544.00000  36.0%  18.7   37s
H 1758  1761                849.0000000  544.00000  35.9%  18.6   37s
  2508  2592  620.00000  549  821  849.00000  544.00000  35.9%  17.2   40s
  3956  3917  752.00000  873  564  849.00000  544.00000  35.9%  19.5   45s
  4650  3921  592.20082   38 12091  849.00000  544.00000  35.9%  19.5   53s
  4652  3922  814.00000  142 1412  849.00000  814.00000  4.12%  19.4   59s
H 4652  3726                848.0000000  814.00000  4.01%  19.4   70s
  4657  3366  825.00000  140  169  848.00000  825.00000  2.71%  19.4   75s
  4671  3375  826.00000  743  682  848.00000  826.00000  2.59%  19.4   80s
  4683  3383  827.59828  141  920  848.00000  827.59828  2.41%  19.3   85s
  4693  3390  828.41964   59  784  848.00000  828.41964  2.31%  19.3   90s
  4697  3392  828.74454  844  796  848.00000  828.74454  2.27%  19.3   96s
H 4700  3224                847.0000000  828.87872  2.14%  19.2   99s
  4702  3226  828.88162  124  788  847.00000  828.88162  2.14%  19.2  100s
  4710  3231  829.64758  378  669  847.00000  829.64758  2.05%  19.2  105s
  4717  3236  830.15148  110  731  847.00000  830.15148  1.99%  19.2  112s
  4720  3238  830.24412  506  661  847.00000  830.24412  1.98%  19.2  115s
  4723  3076  830.29378  365  698  847.00000  830.29378  1.97%  19.2  124s
  4725  3077  830.31005  655  711  847.00000  830.31005  1.97%  19.1  125s
  4741  2273  830.34758  163  122  847.00000  830.34758  1.97%  32.5  130s
  4752  2167  831.13281  142  631  847.00000  831.13281  1.87%  32.5  135s
  4769  2178  833.92407  462  598  847.00000  833.92407  1.54%  32.3  140s
  4789  2191  836.06268   74  417  847.00000  836.06268  1.29%  32.2  145s
H 4793  2084                846.0000000  836.10653  1.17%  32.2  147s
```

```
 81    4802  2090  836.19663  124  493  846.00000  836.19663  1.16%  32.1  150s
 82    4814  2098  836.30562  651  467  846.00000  836.30562  1.15%  32.0  155s
 83    4830  2109  836.51919  178  496  846.00000  836.51919  1.12%  31.9  160s
 84    4838  1905  836.62233  112  605  846.00000  836.62233  1.11%  31.9  166s
 85    4853  1915  836.75862  376  701  846.00000  836.75862  1.09%  31.8  171s
 86    4859  1919  836.80616  510  663  846.00000  836.80616  1.09%  31.7  175s
 87    4869  1926  836.88765  462  649  846.00000  836.88765  1.08%  31.7  180s
 88    4883  1935  836.98385  141  670  846.00000  836.98385  1.07%  31.6  185s
 89    4898  1945  837.06886    6  635  846.00000  837.06886  1.06%  31.5  200s
 90    4911  1954  837.11468  283  617  846.00000  837.11468  1.05%  31.4  205s
 91    4927  1964  837.17008  371  522  846.00000  837.17008  1.04%  31.3  210s
 92  H 4928  1863                     845.0000000  837.17541  0.93%  31.3  211s
 93    4937  1870 infeasible   43       845.00000  837.18135  0.93%  44.2  215s
 94    5371  1891  840.01289   74  188  845.00000  839.01745  0.71%  52.5  220s
 95    6055  1981  841.00000   75  129  845.00000  840.65760  0.51%  58.3  225s
 96    6633  2013  842.00000   73  104  845.00000  841.00000  0.47%  67.5  230s
 97    7153  2115  844.00000   65   76  845.00000  841.58766  0.40%  74.5  235s
 98    7946  1487     cutoff   84       845.00000  842.00000  0.36%  81.5  240s
 99    8759  1424     cutoff   66       845.00000  842.51073  0.29%  89.1  245s
100    9526  1189  843.23663   77  122  845.00000  843.00000  0.24%  95.6  251s
101    9921   876  844.11215   77   62  845.00000  843.00000  0.24%   107  255s
102   10427   284     cutoff   62       845.00000  844.00000  0.12%   117  262s
103   10664    80 infeasible   83       845.00000  844.00000  0.12%   123  265s
104
105  Cutting planes:
106    Learned: 22
107    Gomory: 1
108    Lift-and-project: 22
109    Cover: 20
110    Implied bound: 86
111    MIR: 106
112    Mixing: 1
113    StrongCG: 11
114    Flow cover: 626
115    Inf proof: 11
116    Zero half: 66
117    RLT: 101
118    Relax-and-lift: 1238
119
120  Explored 10993 nodes (1452622 simplex iterations) in 267.03 seconds (250.19 work units)
121  Thread count was 8 (of 8 available processors)
122
123  Solution count 3: 845 845 845
124  No other solutions better than 845
125
126  Optimal solution found (tolerance 1.00e-04)
127  Best objective 8.450000000000e+02, best bound 8.450000000000e+02, gap 0.0000%
128
129  Output optimal solution and the Optimal Obj:  845.0
130
131
132  Obj = 845.0
133
134  Solutions:
135      The total pi =  139.0
136      The total duration time in berth stage =  130.0
137      The total duration time in quay crane scheduling stage =  33.0
138      The total departure time in berth stage=  471.0
139      The total departure time in quay crane scheduling stage =  374.0
140      The total wasted crane work hour according QC0=  5.026899910485351
141      The last depature time in quay crane scheduling stage =  65.0
142
143  The specific solution are as follows:
144      Vessel i: 0:      li: 4,          pi: 16-20,              ai-di: 22-36,              taoi-deltai: 22-36,              periodi: 14,              taoPi_SP-
     deltaPi_SP: 22-25,                  periodPi: 3,                          c_i: 3576403,              dowork: 3691016,                          fa_i: 4
145      Vessel i: 1:      li: 6,          pi: 19-25,              ai-di: 44-59,              taoi-deltai: 44-59,              periodi: 15,              taoPi_SP-
     deltaPi_SP: 44-50,                  periodPi: 6,                          c_i: 3758093,              dowork: 3954660,                          fa_i: 2
146      Vessel i: 2:      li: 5,          pi: 14-19,              ai-di: 60-74,              taoi-deltai: 60-74,              periodi: 14,              taoPi_SP-
     deltaPi_SP: 60-65,                  periodPi: 5,                          c_i: 3485361,              dowork: 3559194,                          fa_i: 2
147      Vessel i: 3:      li: 6,          pi: 19-25,              ai-di: 62-76,              taoi-deltai: 62-76,              periodi: 14,              taoPi_SP-
     deltaPi_SP: 62-64,                  periodPi: 2,                          c_i: 3674552,              dowork: 3691016,                          fa_i: 6
148      Vessel i: 4:      li: 4,          pi: 12-16,              ai-di: 17-36,              taoi-deltai: 17-36,              periodi: 19,              taoPi_SP-
     deltaPi_SP: 17-23,                  periodPi: 6,                          c_i: 4775747,              dowork: 4877414,                          fa_i: 2
149      Vessel i: 5:      li: 7,          pi: 7-14,             ai-di: 51-63,              taoi-deltai: 51-61,              periodi: 10,              taoPi_SP-deltaPi_SP
     : 51-53,                          periodPi: 2,                          c_i: 2421688,              dowork: 2636440,                          fa_i: 3
150      Vessel i: 6:      li: 7,          pi: 5-12,             ai-di: 18-31,              taoi-deltai: 18-28,              periodi: 10,              taoPi_SP-deltaPi_SP
     : 18-21,                          periodPi: 3,                          c_i: 2631858,              dowork: 2636440,                          fa_i: 4
151      Vessel i: 7:      li: 6,          pi: 25-31,              ai-di: 44-67,              taoi-deltai: 44-61,              periodi: 17,              taoPi_SP-
     deltaPi_SP: 44-47,                  periodPi: 3,                          c_i: 4244036,              dowork: 4745592,                          fa_i: 4
152      Vessel i: 8:      li: 5,          pi: 22-27,              ai-di: 23-44,              taoi-deltai: 23-40,              periodi: 17,              taoPi_SP-
     deltaPi_SP: 23-26,                  periodPi: 3,                          c_i: 4380670,              dowork: 4481948,                          fa_i: 5
153  TimeSolveModel: 277.000000
154
155  TimeAll: 280.000000
```

156
157