```
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=52737

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_6.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: 0xb842396e
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, 7e+06]
Presolve removed 184797 rows and 3170 columns
Presolve time: 0.14s
Presolved: 28842 rows, 69154 columns, 83641 nonzeros
Variable types: 0 continuous, 69154 integer (57760 binary)

Root relaxation: objective 3.807333e+02, 3099 iterations, 0.16 seconds (0.34 work units)

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

     0     0  380.73332    0 2202          -  380.73332      -     -    1s
H    0     0                1036.0000000  380.73332  63.2%     -    1s
H    0     0                 608.0000000  380.73332  37.4%     -    2s
H    0     0                 597.0000000  396.05269  33.7%     -    2s
     0     0  396.05269    0 2076  597.00000  396.05269  33.7%     -    3s
     0     0  404.50774    0 2190  597.00000  404.50774  32.2%     -    7s
     0     0  404.69115    0 2184  597.00000  404.69115  32.2%     -    7s
     0     0  404.69127    0 2190  597.00000  404.69127  32.2%     -    7s
     0     0  407.85483    0 1612  597.00000  407.85483  31.7%     -    8s
     0     0  416.46892    0 2047  597.00000  416.46892  30.2%     -    9s
     0     0  418.39667    0 2046  597.00000  418.39667  29.9%     -    9s
     0     0  423.62696    0 1613  597.00000  423.62696  29.0%     -   11s
     0     0  423.62696    0 1458  597.00000  423.62696  29.0%     -   11s
     0     2  423.62696    0 1416  597.00000  423.62696  29.0%     -   14s
     7    12  423.62696    3 1653  597.00000  423.62696  29.0%   316   15s
  1003  1095  423.62696  241 1413  597.00000  423.62696  29.0%  10.9   20s
  2223  2328  423.62696  153 1508  597.00000  423.62696  29.0%  23.0   25s
  2969  2582  506.28093  284 14355  597.00000  423.62696  29.0%  24.2   31s
  2972  2584  580.00000   37 1509  597.00000  580.00000  2.85%  24.2   39s
  2979  2589  583.87594  416 1637  597.00000  583.87594  2.20%  24.1   40s
  2985  2593  587.92730   72 1650  597.00000  587.92730  1.52%  24.1   53s
  2987  2594  592.00000  229 1606  597.00000  592.00000  0.84%  24.1   55s
  2989  2595  592.00000   78 1592  597.00000  592.00000  0.84%  24.1   62s
  2994  2599  593.00000  527 1468  597.00000  593.00000  0.67%  24.0   71s
  2999  2602  593.00000  138 1594  597.00000  593.00000  0.67%  24.0   81s
  3005  2606  595.00000  554 1513  597.00000  595.00000  0.34%  23.9  102s
  3006  2607  595.00000  164 1478  597.00000  595.00000  0.34%  23.9  105s
  3010  2609  595.00000   86 1636  597.00000  595.00000  0.34%  23.9  116s
  3015  2613  595.00000  196 1444  597.00000  595.00000  0.34%  23.9  127s
  3018  2615  595.00000  280 1482  597.00000  595.00000  0.34%  23.8  130s
  3019  2615  595.00000  376 1471  597.00000  595.00000  0.34%  23.8  138s
  3022  2617  595.00000  113 1498  597.00000  595.00000  0.34%  23.8  140s
  3023  2618  595.00000  182 1417  597.00000  595.00000  0.34%  23.8  147s
  3028  2621  595.00000  121 1499  597.00000  595.00000  0.34%  23.8  159s
  3032  2624  595.00000  462 1467  597.00000  595.00000  0.34%  23.7  160s
  3033  2625  595.00000  245 1494  597.00000  595.00000  0.34%  23.7  167s
  3038  2628  595.00000  186 1710  597.00000  595.00000  0.34%  23.7  177s
  3042  2631  595.00000   62 1556  597.00000  595.00000  0.34%  23.6  187s
```

```
  81    3047  2634  595.00000  387 1397  597.00000  595.00000  0.34%  23.6  195s
  82    3053  2638  595.00000   99 1554  597.00000  595.00000  0.34%  23.6  216s
  83    3058  2641  595.00000   62 1534  597.00000  595.00000  0.34%  23.5  234s
  84    3060  2643  595.00000  125 1568  597.00000  595.00000  0.34%  23.5  235s
  85    3065  2646  595.00000   68 1528  597.00000  595.00000  0.34%  23.5  243s
  86    3069  2649  595.00000  284 1510  597.00000  595.00000  0.34%  23.4  260s
  87    3074  2652  595.00000  494 1626  597.00000  595.00000  0.34%  23.4  273s
  88    3079  2655  595.00000  416 1691  597.00000  595.00000  0.34%  23.4  287s
  89    3084  2659  595.00000   60 1602  597.00000  595.00000  0.34%  23.3  331s
  90    3090  2663  595.00000   54 1647  597.00000  595.00000  0.34%  23.3  343s
  91    3094  2665  595.00000  527 1663  597.00000  595.00000  0.34%  23.2  345s
  92    3095  2666  595.00000  103 1669  597.00000  595.00000  0.34%  23.2  355s
  93    3100  2669  595.00000  192 1497  597.00000  595.00000  0.34%  23.2  367s
  94    3105  2673  595.00000  554 1466  597.00000  595.00000  0.34%  23.2  378s
  95    3109  2675  595.00000  183 1579  597.00000  595.00000  0.34%  23.1  380s
  96    3110  2676  595.00000   86 1613  597.00000  595.00000  0.34%  23.1  395s
  97    3115  2679  595.00000  196 1718  597.00000  595.00000  0.34%  23.1  407s
  98    3120  2683  595.00000  202 1609  597.00000  595.00000  0.34%  23.1  417s
  99    3124  2685  595.00000  300 1645  597.00000  595.00000  0.34%  23.0  434s
 100    3127  2687  595.00000  395 1742  597.00000  595.00000  0.34%  23.0  435s
 101    3129  2689  595.00000   29 1494  597.00000  595.00000  0.34%  23.0  444s
 102    3130  2689  595.00000  487 1518  597.00000  595.00000  0.34%  23.0  445s
 103    3133  2691  595.00000  245 1571  597.00000  595.00000  0.34%  23.0  457s
 104    3136  2693  595.00000  328 1580  597.00000  595.00000  0.34%  22.9  469s
 105    3139  2695  595.00000  113 1699  597.00000  595.00000  0.34%  22.9  470s
 106    3141  2697  595.00000   65 1582  597.00000  595.00000  0.34%  22.9  486s
 107    3145  2699  595.00000  410 1614  597.00000  595.00000  0.34%  22.9  497s
 108    3152  2704  595.00000   80 1549  597.00000  595.00000  0.34%  22.8  508s
 109
 110  Optimal solution found at node 3152 - now completing solution pool...
 111    3153  2705  597.00000   99 1528  608.00000  597.00000  1.81%  22.8  509s
 112    3157  2707  597.00000  298 1600  608.00000  597.00000  1.81%  22.8  510s
 113    3158  2708  597.00000   62 1514  608.00000  597.00000  1.81%  22.8  519s
 114    3160  2709  597.00000  125 1584  608.00000  597.00000  1.81%  22.8  520s
 115    3162  2711  597.00000   26 1622  608.00000  597.00000  1.81%  22.7  533s
 116    3167  2714  597.00000  280 1502  608.00000  597.00000  1.81%  22.7  542s
 117    3172  2717  597.00000   37 1504  608.00000  597.00000  1.81%  22.7  574s
 118    3173  2718  597.00000  323 1562  608.00000  597.00000  1.81%  22.7  575s
 119    3176  2720  597.00000   21 1499  608.00000  597.00000  1.81%  22.6  584s
 120    3179  2722  597.00000  416 1634  608.00000  597.00000  1.81%  22.6  585s
 121    3180  2723  597.00000  136 1495  608.00000  597.00000  1.81%  22.6  592s
 122    3184  2725  597.00000   60 1579  608.00000  597.00000  1.81%  22.6  603s
 123    3188  2728  597.00000   23 1489  608.00000  597.00000  1.81%  22.6  619s
 124    3191  2730  597.00000  286 1603  608.00000  597.00000  1.81%  22.5  620s
 125    3193  2731  597.00000  175 1499  608.00000  597.00000  1.81%  22.5  633s
 126    3198  2735  597.00000  200 1444  608.00000  597.00000  1.81%  22.5  642s
 127    3203  2738  597.00000  215 1525  608.00000  597.00000  1.81%  22.5  654s
 128    3206  2740  597.00000  164 1598  608.00000  597.00000  1.81%  22.4  655s
 129    3207  2741  597.00000   34 1541  608.00000  597.00000  1.81%  22.4  663s
 130    3209  2742  597.00000  183 1566  608.00000  597.00000  1.81%  22.4  665s
 131    3210  2743  597.00000   86 1640  608.00000  597.00000  1.81%  22.4  682s
 132    3216  2747  597.00000  439 1509  608.00000  597.00000  1.81%  22.4  709s
 133    3218  2748  597.00000  280 1506  608.00000  597.00000  1.81%  22.3  710s
 134    3219  2749  597.00000  376 1581  608.00000  597.00000  1.81%  22.3  719s
 135    3222  2751  597.00000  113 1543  608.00000  597.00000  1.81%  22.3  720s
 136    3224  2752  597.00000  300 1593  608.00000  597.00000  1.81%  22.3  729s
 137    3226  2753  597.00000  343 1611  608.00000  597.00000  1.81%  22.3  730s
 138    3229  2755  597.00000   29 1573  608.00000  597.00000  1.81%  22.3  743s
 139    3236  2760  597.00000  328 1615  608.00000  597.00000  1.81%  22.2  757s
 140    3242  2764  597.00000   62 1849  608.00000  597.00000  1.81%  22.2  781s
 141    3249  2769  597.00000   70 1779  608.00000  597.00000  1.81%  22.1  802s
 142    3251  2770  597.00000  375 1781  608.00000  597.00000  1.81%  22.1  805s
 143    3256  2773  597.00000  182 1635  608.00000  597.00000  1.81%  22.1  819s
 144    3257  2774  597.00000  298 1839  608.00000  597.00000  1.81%  22.1  820s
 145    3263  2778  597.00000   86 1520  608.00000  597.00000  1.81%  22.0  837s
 146    3266  2780  597.00000  195 1591  608.00000  597.00000  1.81%  22.0  858s
 147    3267  2781  597.00000  280 1618  608.00000  597.00000  1.81%  22.0  861s
 148    3271  2783  597.00000  390 1767  608.00000  597.00000  1.81%  22.0  892s
 149
 150      Nodes    |    Current Node    |     Pool Obj. Bounds     |     Work
 151           |               |   Worst                  |
 152  Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
 153
 154    3272  2787  597.00000   16  998  608.00000  597.00000  1.81%  80.6  895s
 155    3282  2792  597.00000   19  865  608.00000  597.00000  1.81%  86.1  900s
 156    3361  2844  597.00000   30  346  608.00000  597.00000  1.81%  90.5  906s
 157    3384  2846  597.00000   33  378  608.00000  597.00000  1.81%  93.8  910s
 158    3400  2839 infeasible   35       608.00000  597.00000  1.81%  95.8  916s
 159    3409  2836 infeasible   36       608.00000  597.00000  1.81%  97.0  920s
 160    3421  2834 infeasible   36       608.00000  597.00000  1.81%   100  928s
 161    3427  2837 infeasible   36       608.00000  597.00000  1.81%   101  932s
 162    3434  2838  597.00000   27  474  608.00000  597.00000  1.81%   103  941s
 163    3441  2838     cutoff   28       608.00000  597.00000  1.81%   103  947s
 164    3449  2843  597.00000   27  382  608.00000  597.00000  1.81%   105  956s
```

```
 3457  2843  597.00000   29  187  608.00000  597.00000  1.81%   105  963s
 3462  2846  597.00000   30  271  608.00000  597.00000  1.81%   106  972s
 3557  2955  597.00000   51  283  608.00000  597.00000  1.81%   106  975s
 3867  3160  597.00000  131  208  608.00000  597.00000  1.81%   102  980s
 4300  3451  597.00000  250  132  608.00000  597.00000  1.81%  95.4  985s
 4555  3603  597.00000   24  645  608.00000  597.00000  1.81%  93.9  990s
 4836  3800  597.00000   84  555  608.00000  597.00000  1.81%  90.2  995s
 5051  3914  597.00000  135  514  608.00000  597.00000  1.81%  88.7 1000s
 5340  4128  597.00000  206  556  608.00000  597.00000  1.81%  86.0 1006s
 5589  4293  597.00000  268  489  608.00000  597.00000  1.81%  84.1 1011s
 5780  4443  597.00000  316  452  608.00000  597.00000  1.81%  82.9 1015s
 6100  4619  597.00000  384  416  608.00000  597.00000  1.81%  82.0 1021s
 6298  4778  597.00000  440  377  608.00000  597.00000  1.81%  83.8 1026s
 6494  4892  597.00000  481  327  608.00000  597.00000  1.81%  86.2 1031s
 6753  5090  597.00000   34  663  608.00000  597.00000  1.81%  88.5 1036s
 7113  5252  597.00000  126  523  608.00000  597.00000  1.81%  86.7 1041s
 7500  5504  597.00000  188  532  608.00000  597.00000  1.81%  85.5 1046s
 7898  5775  597.00000  293  508  608.00000  597.00000  1.81%  85.3 1051s
 8088  5924  597.00000  341  465  608.00000  597.00000  1.81%  84.9 1055s
 8516  6198  597.00000  449  408  608.00000  597.00000  1.81%  86.6 1061s
 9005  6457  597.00000  108  473  608.00000  597.00000  1.81%  87.9 1067s
 9220  6639  597.00000  166  521  608.00000  597.00000  1.81%  89.0 1070s
 9800  6859  597.00000  308  450  608.00000  597.00000  1.81%  89.7 1078s
10092  6846  597.00000   62  550  608.00000  597.00000  1.81%  92.0 1082s
10403  7038  597.00000   82  340  608.00000  597.00000  1.81%  93.7 1088s
10864  7601 infeasible  118       608.00000  597.00000  1.81%  95.0 1092s
11669  7659  597.00000  187  504  608.00000  597.00000  1.81%  92.1 1095s
12965  8947  597.00000  510  278  608.00000  597.00000  1.81%  84.4 1100s
13318  8951  597.00000   50  433  608.00000  597.00000  1.81%  84.6 1112s
13412  9507  597.00000   63  384  608.00000  597.00000  1.81%  86.1 1117s
14249 10098  597.00000   98  537  608.00000  597.00000  1.81%  86.1 1121s
14862 10861  597.00000  128  557  608.00000  597.00000  1.81%  87.3 1125s
15622 11533  597.00000  162  526  608.00000  597.00000  1.81%  87.1 1130s
16728 12623  597.00000  225  481  608.00000  597.00000  1.81%  86.6 1136s
17722 13272  597.00000  286  439  608.00000  597.00000  1.81%  85.3 1141s
18278 13780  597.00000  343  417  608.00000  597.00000  1.81%  86.3 1145s
18788 14337  597.00000  403  360  608.00000  597.00000  1.81%  87.3 1150s
19840 14943  597.00000  132  452  608.00000  597.00000  1.81%  85.9 1155s
20313 15335 infeasible  354       608.00000  597.00000  1.81%  88.2 1160s
20714 16162  597.00000  201  598  608.00000  597.00000  1.81%  90.8 1168s
21278 16351     cutoff  520       608.00000  597.00000  1.81%  92.9 1172s
21533 16732  597.00000  240  446  608.00000  597.00000  1.81%  94.4 1176s
22042 17181  597.00000  150  244  608.00000  597.00000  1.81%  96.0 1181s
22604 17578  597.00000  275  489  608.00000  597.00000  1.81%  96.5 1185s
23450 18332  597.00000  103  551  608.00000  597.00000  1.81%  98.1 1192s
24299 18594  597.00000  421  400  608.00000  597.00000  1.81%  97.0 1196s
24672 19159  597.00000   88  619  608.00000  597.00000  1.81%  97.1 1200s

Cutting planes:
  Learned: 170
  Cover: 10
  Implied bound: 42
  Projected implied bound: 2
  Clique: 1
  MIR: 419
  StrongCG: 4
  Flow cover: 2407
  Zero half: 35
  RLT: 8
  Relax-and-lift: 5727

Explored 25344 nodes (2452721 simplex iterations) in 1200.21 seconds (1297.22 work units)
Thread count was 8 (of 8 available processors)

Solution count 3: 597 599 608

Time limit reached
Best objective 5.970000000000e+02, best bound 5.970000000000e+02, gap 0.0000%

Output one feasible solution with limited computation time

Optimization was stopped with status 9

Number of solution stored: 3
    597  599  608

Obj = 597.0

Solutions:
     The total pi =  160.0
     The total duration time in berth stage =  157.0
     The total duration time in quay crane scheduling stage =  30.0
     The total departure time in berth stage=  362.0
     The total departure time in quay crane scheduling stage =  235.0
```

```
249     The total wasted crane work hour according QC0=  11.719800185098087
250     The last depature time in quay crane scheduling stage =  51.0
251
252 The specific solution are as follows:
253     Vessel i: 0:    li: 5,          pi: 28-33,              ai-di: 18-28,           taoi-deltai: 18-28,             periodi: 10,            taoPi_SP-
    deltaPi_SP: 18-20,                  periodPi: 2,                    c_i: 2427898,           dowork: 2636440,                fa_i: 5
254     Vessel i: 1:    li: 5,          pi: 14-19,              ai-di: 43-56,           taoi-deltai: 43-56,             periodi: 13,            taoPi_SP-
    deltaPi_SP: 43-46,                  periodPi: 3,                    c_i: 3276636,           dowork: 3427372,                fa_i: 4
255     Vessel i: 2:    li: 5,          pi: 19-24,              ai-di: 7-24,            taoi-deltai: 7-24,              periodi: 17,            taoPi_SP-deltaPi_SP
    : 7-10,                         periodPi: 3,                    c_i: 4350546,           dowork: 4745592,                fa_i: 4
256     Vessel i: 3:    li: 4,          pi: 10-14,              ai-di: 0-11,            taoi-deltai: 0-11,              periodi: 11,            taoPi_SP-deltaPi_SP
    : 0-3,                          periodPi: 3,                    c_i: 2636652,           dowork: 3954660,                fa_i: 3
257     Vessel i: 4:    li: 6,          pi: 19-25,              ai-di: 37-49,           taoi-deltai: 37-49,             periodi: 12,            taoPi_SP-
    deltaPi_SP: 37-39,                  periodPi: 2,                    c_i: 3098943,           dowork: 3427372,                fa_i: 6
258     Vessel i: 5:    li: 4,          pi: 24-28,              ai-di: 3-30,            taoi-deltai: 3-27,              periodi: 24,            taoPi_SP-deltaPi_SP
    : 3-7,                          periodPi: 4,                    c_i: 6232095,           dowork: 6327456,                fa_i: 4
259     Vessel i: 6:    li: 7,          pi: 25-32,              ai-di: 45-73,           taoi-deltai: 45-71,             periodi: 26,            taoPi_SP-
    deltaPi_SP: 45-51,                  periodPi: 6,                    c_i: 6830173,           dowork: 7118388,                fa_i: 3
260     Vessel i: 7:    li: 7,          pi: 7-14,               ai-di: 38-65,           taoi-deltai: 38-58,             periodi: 20,            taoPi_SP-deltaPi_SP
    : 38-41,                        periodPi: 3,                    c_i: 5190682,           dowork: 5272880,                fa_i: 7
261     Vessel i: 8:    li: 5,          pi: 14-19,              ai-di: 14-40,           taoi-deltai: 14-38,             periodi: 24,            taoPi_SP-
    deltaPi_SP: 14-18,                  periodPi: 4,                    c_i: 6104136,           dowork: 6327456,                fa_i: 4
262 TimeSolveModel: 1209.000000
263
264 TimeAll: 1213.000000
265
266
```