```
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=15227

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_7.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: 0x94dca6ca
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, 6e+06]
Presolve removed 186358 rows and 3227 columns
Presolve time: 0.14s
Presolved: 27281 rows, 69097 columns, 79150 nonzeros
Variable types: 0 continuous, 69097 integer (57703 binary)
Found heuristic solution: objective 994.0000000

Root relaxation: objective 4.133395e+02, 2970 iterations, 0.14 seconds (0.28 work units)

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

     0     0  413.33952    0 2139  994.00000  413.33952  58.4%     -    1s
H    0     0                       668.0000000  413.33952  38.1%     -    2s
H    0     0                       663.0000000  433.90345  34.6%     -    2s
     0     0  433.90345    0 1893  663.00000  433.90345  34.6%     -    3s
     0     0  439.41910    0 2104  663.00000  439.41910  33.7%     -    7s
     0     0  439.61078    0 2139  663.00000  439.61078  33.7%     -    7s
     0     0  443.28082    0 1997  663.00000  443.28082  33.1%     -    7s
     0     0  443.76462    0 2080  663.00000  443.76462  33.1%     -    9s
     0     0  443.76656    0 2080  663.00000  443.76656  33.1%     -    9s
     0     0  453.88259    0 1662  663.00000  453.88259  31.5%     -   10s
     0     0  455.56676    0 1780  663.00000  455.56676  31.3%     -   12s
     0     0  455.78721    0 1780  663.00000  455.78721  31.3%     -   12s
     0     0  455.78721    0 1737  663.00000  455.78721  31.3%     -   12s
     0     0  455.88744    0 1685  663.00000  455.88744  31.2%     -   13s
     0     0  455.88744    0 1624  663.00000  455.88744  31.2%     -   13s
     0     2  455.88744    0 1610  663.00000  455.88744  31.2%     -   19s
   111   118  455.88744   28 1459  663.00000  455.88744  31.2%  32.3   20s
  1387  1439  489.57087  357  959  663.00000  455.88744  31.2%   9.0   25s
  1957  2023  495.22688  497  843  663.00000  455.88744  31.2%  21.6   30s
  2815  2856  517.00000  715  709  663.00000  455.88744  31.2%  40.6   35s
  3794  3764  572.07136  874  620  663.00000  455.88744  31.2%  48.5   40s
  4367  3778  480.01250   95 13569  663.00000  455.88744  31.2%  46.7   47s
  4369  3779  644.00000  737 1521  663.00000  644.00000  2.87%  46.7   50s
  4370  3780  644.00000  110 1561  663.00000  644.00000  2.87%  46.7   57s
  4379  3786  657.69563   36 1593  663.00000  657.69563  0.80%  46.6   63s
  4380  3787  658.70232  186 1548  663.00000  658.70232  0.65%  46.5   65s
  4386  3791  658.93877  134 1500  663.00000  658.93877  0.61%  46.5   70s
  4391  3794  658.98013   83 1572  663.00000  658.98013  0.61%  46.4   77s
  4395  3797  659.48125  283 1514  663.00000  659.48125  0.53%  46.4   80s
  4396  3797  659.52261  414 1504  663.00000  659.52261  0.52%  46.4   85s
  4402  3801  660.56356  307 1492  663.00000  660.56356  0.37%  46.3   90s

Optimal solution found at node 4405 - now completing solution pool...
  4406  3804  663.00000  581 1473  664.00000  663.00000  0.15%  46.3   94s
  4408  3805  663.00000  464 1485  664.00000  663.00000  0.15%  46.3  100s
  4412  3808  663.00000  479 1385  664.00000  663.00000  0.15%  46.2  109s
  4414  3809  663.00000  428 1389  664.00000  663.00000  0.15%  46.2  110s
```

```
 81    4421  3814  663.00000  339 1503  664.00000  663.00000  0.15%  46.1  119s
 82    4425  3817  663.00000  885 1470  664.00000  663.00000  0.15%  46.1  120s
 83    4430  3820  663.00000   58 1489  664.00000  663.00000  0.15%  46.0  125s
 84    4431  3821  663.00000  254 1484  664.00000  663.00000  0.15%  46.0  131s
 85    4436  3824  663.00000  347 1479  664.00000  663.00000  0.15%  46.0  137s
 86    4441  3827  663.00000  678 1562  664.00000  663.00000  0.15%  45.9  142s
 87    4447  3831  663.00000    4 1609  664.00000  663.00000  0.15%  45.8  151s
 88    4453  3835  663.00000  484 1405  664.00000  663.00000  0.15%  45.8  166s
 89    4460  3840  663.00000  254 1476  664.00000  663.00000  0.15%  45.7  175s
 90    4466  3844  663.00000  242 1582  664.00000  663.00000  0.15%  45.7  181s
 91    4474  3849  663.00000  299 1585  664.00000  663.00000  0.15%  45.6  186s
 92    4481  3854  663.00000   93 1606  664.00000  663.00000  0.15%  45.5  202s
 93    4489  3859  663.00000  521 1821  664.00000  663.00000  0.15%  45.4  215s
 94    4496  3864  663.00000  414 1714  664.00000  663.00000  0.15%  45.3  224s
 95    4498  3865  663.00000  198 1760  664.00000  663.00000  0.15%  45.3  225s
 96    4506  3871  663.00000  581 1773  664.00000  663.00000  0.15%  45.2  244s
 97    4510  3873  663.00000  453 1779  664.00000  663.00000  0.15%  45.2  245s
 98    4514  3876  663.00000  428 1741  664.00000  663.00000  0.15%  45.2  270s
 99    4521  3881  663.00000  339 1637  664.00000  663.00000  0.15%  45.1  287s
100    4531  3887  663.00000  254 1696  664.00000  663.00000  0.15%  45.0  297s
101    4538  3892  663.00000  102 1815  664.00000  663.00000  0.15%  44.9  307s
102    4545  3897  663.00000  634 1838  664.00000  663.00000  0.15%  44.9  310s
103    4546  3897  663.00000  146 1759  664.00000  663.00000  0.15%  44.8  330s
104    4561  3907  663.00000   83 1682  664.00000  663.00000  0.15%  44.7  342s
105    4569  3913  663.00000  737 1769  664.00000  663.00000  0.15%  44.6  355s
106    4577  3918  663.00000  485 1684  664.00000  663.00000  0.15%  44.5  372s
107    4583  3922  663.00000   26 1764  664.00000  663.00000  0.15%  44.5  383s
108    4590  3927  663.00000   63 1828  664.00000  663.00000  0.15%  44.4  385s
109    4591  3927  663.00000   83 1773  664.00000  663.00000  0.15%  44.4  398s
110    4595  3930  663.00000  283 1831  664.00000  663.00000  0.15%  44.4  400s
111    4599  3933  663.00000  443 1759  664.00000  663.00000  0.15%  44.3  431s
112    4607  3938  663.00000  550 1770  664.00000  663.00000  0.15%  44.3  443s
113    4612  3941  663.00000  479 1764  664.00000  663.00000  0.15%  44.2  445s
114    4613  3942  663.00000   34 1702  664.00000  663.00000  0.15%  44.2  458s
115    4617  3945  663.00000  102 1805  664.00000  663.00000  0.15%  44.2  460s
116    4620  3947  663.00000  466 1699  664.00000  663.00000  0.15%  44.1  470s
117    4628  3952  663.00000  208 1736  664.00000  663.00000  0.15%  44.1  494s
118    4630  3953  663.00000   58 1764  664.00000  663.00000  0.15%  44.0  495s
119    4635  3957  663.00000  165 1755  664.00000  663.00000  0.15%  44.0  516s
120    4642  3961  663.00000  801 1755  664.00000  663.00000  0.15%  43.9  541s
121    4649  3966  663.00000  676 1776  664.00000  663.00000  0.15%  43.9  572s
122    4656  3971  663.00000   93 1776  664.00000  663.00000  0.15%  43.8  624s
123    4658  3972  663.00000  298 1760  664.00000  663.00000  0.15%  43.8  625s
124    4662  3975  663.00000   94 1762  664.00000  663.00000  0.15%  43.7  654s
125    4665  3977  663.00000  319 1793  664.00000  663.00000  0.15%  43.7  655s
126    4668  3979  663.00000  839 1780  664.00000  663.00000  0.15%  43.7  678s
127    4673  3982  663.00000   76 1843  664.00000  663.00000  0.15%  43.6  680s
128    4674  3983  663.00000  299 1737  664.00000  663.00000  0.15%  43.6  695s
129    4680  3987  663.00000  186 1723  664.00000  663.00000  0.15%  43.6  713s
130    4684  3989  663.00000  195 1820  664.00000  663.00000  0.15%  43.5  715s
131    4686  3991  663.00000  134 1872  664.00000  663.00000  0.15%  43.5  756s
132    4689  3993  663.00000  521 1844  664.00000  663.00000  0.15%  43.5  780s
133    4695  3997  663.00000  283 1769  664.00000  663.00000  0.15%  43.4  801s
134    4700  4000  663.00000  294 1832  664.00000  663.00000  0.15%  43.4  827s
135    4706  4004  663.00000  581 1831  664.00000  663.00000  0.15%  43.3  861s
136    4713  4009  663.00000   34 1805  664.00000  663.00000  0.15%  43.3  952s
137    4720  4013  663.00000  466 1767  664.00000  663.00000  0.15%  43.2  988s
138    4726  4017  663.00000  201 1883  664.00000  663.00000  0.15%  43.1  990s
139    4727  4018  663.00000  801 1849  664.00000  663.00000  0.15%  43.1 1018s
140    4730  4020  663.00000   58 1858  664.00000  663.00000  0.15%  43.1 1020s
141    4731  4021  663.00000  254 1866  664.00000  663.00000  0.15%  43.1 1047s
142    4737  4025  663.00000  348 1845  664.00000  663.00000  0.15%  43.0 1050s
143    4743  3637  663.00000  295 1419  664.00000  663.00000  0.15%  86.2 1060s
144    4748  3640  663.00000  463 1632  664.00000  663.00000  0.15%  86.1 1070s
145    4752  3643  663.00000  822 1584  664.00000  663.00000  0.15%  86.1 1095s
146
147      Nodes    |    Current Node    |     Pool Obj. Bounds     |      Work
148               |                    |  Worst                   |
149  Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
150
151    5009  3828  663.00000   55  853  664.00000  663.00000  0.15%  96.3 1100s
152    5580  4223  663.00000  130  822  664.00000  663.00000  0.15%   102 1105s
153    6187  4632  663.00000  203  772  664.00000  663.00000  0.15%   108 1110s
154    6738  4995  663.00000  293  746  664.00000  663.00000  0.15%   115 1115s
155    7275  5357  663.00000  373  715  664.00000  663.00000  0.15%   120 1120s
156    7813  5690  663.00000  455  692  664.00000  663.00000  0.15%   125 1125s
157    8545  6137  663.00000  551  659  664.00000  663.00000  0.15%   129 1131s
158    8885  6329  663.00000  586  588  664.00000  663.00000  0.15%   132 1135s
159    9379  6734  663.00000  650  602  664.00000  663.00000  0.15%   135 1140s
160   10126  7063  663.00000  726  507  664.00000  663.00000  0.15%   136 1145s
161   11033  7539  663.00000  813  555  664.00000  663.00000  0.15%   136 1151s
162   11551  7813  663.00000  873  491  664.00000  663.00000  0.15%   138 1155s
163   11959  8206  663.00000  929  467  664.00000  663.00000  0.15%   141 1160s
164   12712  8465 infeasible 1020       664.00000  663.00000  0.15%   144 1165s
```

```
Cutting planes:
  Learned: 5
  Gomory: 4
  Cover: 1
  Implied bound: 7
  Clique: 1
  MIR: 427
  StrongCG: 21
  Flow cover: 621
  Zero half: 15
  RLT: 49
  Relax-and-lift: 2216

Explored 12975 nodes (1888752 simplex iterations) in 1169.48 seconds (1243.94 work units)
Thread count was 8 (of 8 available processors)

Solution count 3: 663 663 663
No other solutions better than 663

Optimal solution found (tolerance 1.00e-04)
Best objective 6.630000000000e+02, best bound 6.630000000000e+02, gap 0.0000%

Output optimal solution and the Optimal Obj:  663.0


Obj = 663.0

Solutions:
    The total pi =  155.0
    The total duration time in berth stage =  154.0
    The total duration time in quay crane scheduling stage =  33.0
    The total departure time in berth stage=  392.0
    The total departure time in quay crane scheduling stage =  271.0
    The total wasted crane work hour according QC0=  20.56509914885224
    The last depature time in quay crane scheduling stage =  61.0

The specific solution are as follows:
    Vessel i: 0:    li: 5,    pi: 24-29,    ai-di: 36-53,    taoi-deltai: 36-53,    periodi: 17,    taoPi_SP-deltaPi_SP: 36-39,    periodPi: 3,    c_i: 4354230,    dowork: 5536524,    fa_i: 5
    Vessel i: 1:    li: 6,    pi: 14-20,    ai-di: 2-14,    taoi-deltai: 2-14,    periodi: 12,    taoPi_SP-deltaPi_SP: 2-5,    periodPi: 3,    c_i: 3002638,    dowork: 3163728,    fa_i: 5
    Vessel i: 2:    li: 5,    pi: 19-24,    ai-di: 30-52,    taoi-deltai: 30-52,    periodi: 22,    taoPi_SP-deltaPi_SP: 30-37,    periodPi: 7,    c_i: 5632093,    dowork: 6063812,    fa_i: 2
    Vessel i: 3:    li: 5,    pi: 14-19,    ai-di: 43-67,    taoi-deltai: 43-67,    periodi: 24,    taoPi_SP-deltaPi_SP: 43-47,    periodPi: 4,    c_i: 6127527,    dowork: 6195634,    fa_i: 4
    Vessel i: 4:    li: 6,    pi: 8-14,    ai-di: 50-64,    taoi-deltai: 50-64,    periodi: 14,    taoPi_SP-deltaPi_SP: 50-53,    periodPi: 3,    c_i: 3660402,    dowork: 3822838,    fa_i: 3
    Vessel i: 5:    li: 5,    pi: 9-14,    ai-di: 14-42,    taoi-deltai: 14-39,    periodi: 25,    taoPi_SP-deltaPi_SP: 14-18,    periodPi: 4,    c_i: 6378313,    dowork: 7382032,    fa_i: 5
    Vessel i: 6:    li: 6,    pi: 25-31,    ai-di: 1-13,    taoi-deltai: 1-13,    periodi: 12,    taoPi_SP-deltaPi_SP: 1-4,    periodPi: 3,    c_i: 3105385,    dowork: 3954660,    fa_i: 3
    Vessel i: 7:    li: 5,    pi: 20-25,    ai-di: 5-22,    taoi-deltai: 5-16,    periodi: 11,    taoPi_SP-deltaPi_SP: 5-7,    periodPi: 2,    c_i: 2734109,    dowork: 3691016,    fa_i: 5
    Vessel i: 8:    li: 4,    pi: 22-26,    ai-di: 57-76,    taoi-deltai: 57-74,    periodi: 17,    taoPi_SP-deltaPi_SP: 57-61,    periodPi: 4,    c_i: 4402918,    dowork: 5009236,    fa_i: 3
TimeSolveModel: 1178.000000

TimeAll: 1182.000000
```