```
D:\Python\Python\setroute\python.exe "D:\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Python\Pyt
      mode=client --port=55050
 3
      import sys; print('Python %s on %s' % (sys.version, sys.platform))
      6
     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
 8
     main_DM.py', wdir='E:/1 000/3 00000/1 000000/1 000000/1 000000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1
10
     Backend TkAgg is interactive backend. Turning interactive mode on.
11
      Waiting 5s.....
     Optimize the ./R 5 5.xlsx instance
13
14
15
     Set parameter TimeLimit to value 1200
16
     Set parameter PoolSolutions to value 3
17
18
     Set parameter PoolGap to value 0.05
      Set parameter PoolSearchMode to value 2
19
20
     Gurobi Optimizer version 11.0.0 build v11.0.0rc2 (win64 - Windows 10.0 (19045.2))
21
22 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
24
      Optimize a model with 71827 rows, 39860 columns and 208375 nonzeros
25
26
     Model fingerprint: 0xe84e1789
      Variable types: 0 continuous, 39860 integer (33525 binary)
     Coefficient statistics:
28
29
       Matrix range [1e+00, 5e+05]
30
       Objective range [1e+00, 1e+00]
       Bounds range [1e+00, 1e+00]
31
32
       RHS range
                              [1e+00, 7e+06]
33
     Presolve removed 59065 rows and 1551 columns
     Presolve time: 0.09s
      Presolved: 12762 rows, 38309 columns, 36038 nonzeros
35
36
      Variable types: 0 continuous, 38309 integer (31979 binary)
      Found heuristic solution: objective 614.0000000
38
39
     Root relaxation: objective 2.582444e+02, 1702 iterations, 0.08 seconds (0.19 work units)
40
41
         Nodes | Current Node | Objective Bounds
       Expl\ Unexpl\ |\ Obj\ Depth\ IntInf\ |\ Incumbent \quad BestBd\ Gap\ |\ It/Node\ Time
42
43
44
                45
     H \quad 0 \quad 0
                                       421.0000000 258.24439 38.7%
                                       420.0000000 258.24439 38.5%
46
     Н
           0
                  0
47
     Η
          0
                  0
                                       419.0000000 269.20796 35.7%
                0 269.20796  0 1165 419.00000 269.20796 35.7% -
48
49
                0 276.89315
                                     0 1419 419.00000 276.89315 33.9%
                                       0 1421 419.00000 276.89315 33.9%
50
          0
                0 276.89315
                                                                                                        6s
51
                0 276.89315
                                       0 1169 419.00000 276.89315 33.9%
52
                0 277.05170
                                     0 1388 419.00000 277.05170 33.9%
                                                                                                        7s
53
                0 277.69131 0 1115 419.00000 277.69131 33.7%
          0
                                                                                                        8s
54
                0 277.84546
                                       0 1164 419.00000 277.84546 33.7%
                                                                                                        98
55
                 0 277.86797
                                       0 1339 419.00000 277.86797 33.7%
                                                                                                        9s
56
                0 277.87711
                                      0 1336 419.00000 277.87711 33.7%
                                                                                                        98
                0 278.46383
57
          0
                                       0 1226 419.00000 278.46383 33.5%
                                                                                                   - 10s
58
          0
                0 278.52240
                                       0 956 419.00000 278.52240 33.5%
                                       0 1272 419.00000 278.53751 33.5%
                0 278.53751
60
                                       0 1040 419.00000 278.71552 33.5%
          0
                0 278.71552
                                                                                                   - 11s
61
          0
                0 278.75132
                                       0 1247 419.00000 278.75132 33.5%
                                                                                                   - 13s
                0 278.75132
                                       0 1248 419.00000 278.75132 33.5%
63
          0
                0 279.07444
                                      0 1218 419.00000 279.07444 33.4%
                                                                                                   - 13s
                0 279 07701 0 1213 419 00000 279 07701 33 4%
                                                                                                   - 14s
64
          0
65
                2 305.00000  0 1209 419.00000 305.00000 27.2%
                                                                                                      18s
        922 933 310.39319 229 887 419.00000 305.00000 27.2% 5.8 20s
66
       1969 1677 402.00000 363 978 419.00000 402.00000 4.06% 16.9 25s
67
68
69
      Optimal solution found at node 1970 - now completing solution pool..
       1971 1679 419.00000 20 985 420.00000 419.00000 0.24% 16.9 29s
70
      Total elapsed time = 30.22s (DegenMoves)
72
      Total elapsed time = 35.04s (DegenMoves)
         Nodes | Current Node | Pool Obj. Bounds | Work
74
75
                                      Worst
76
       Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
       2246 1872 419.00000 46 677 420.00000 419.00000 0.24% 36.2 40s
78
79
       3397\ 2498\ 419.00000\ 210\ 582\ 420.00000\ 419.00000\ 0.24\%\ 48.4\ 45s
80
       3973 2638 419.00000 286 380 420.00000 419.00000 0.24% 57.4 50s
```

```
unknown
 81
       5781 3301 419.00000 158 462 420.00000 419.00000 0.24% 66.7 55s
 82
       8494 4660 419.00000 338 367 420.00000 419.00000 0.24% 61.1 60s
      11257 6561 419.00000 19 464 420.00000 419.00000 0.24% 53.5 65s
 83
 84
 85 Cutting planes:
 86
       Learned: 139
       Gomory: 42
 87
 88
       Implied bound: 14
 89
       Projected implied bound: 13
 90
       MIR: 706
       StrongCG: 120
 91
 92
       Flow cover: 1225
 93
       Inf proof: 1
 94
       Zero half: 57
 95
       RLT: 201
 96
       Relax-and-lift: 2421
 97
 98 Explored 13130 nodes (671883 simplex iterations) in 68.75 seconds (113.39 work units)
 99
     Thread count was 8 (of 8 available processors)
 100
101 Solution count 3: 419 419 419
102 No other solutions better than 419
103
104 Optimal solution found (tolerance 1.00e-04)
105 Best objective 4.190000000000e+02, best bound 4.19000000000e+02, gap 0.0000%
106
107
     Output optimal solution and the Optimal Obj: 419.0
108
109
110 Obj = 419.0
111
112 Solutions:
113
         The total pi = 84.0
114
         The total duration time in berth stage = 100.0
115
         The total duration time in quay crane scheduling stage = 27.0
         The total departure time in berth stage= 246.0
116
117
         The total departure time in quay crane scheduling stage = 173.0
         The total wasted crane work hour according QC0= 16.441652379724175
118
119
         The last depature time in quay crane scheduling stage = 60.0
120
121 The specific solution are as follows:
        Vessel i: 0: li: 6,
122
                                  pi: 16-22,
                                                          ai-di: 57-73,
                                                                                  taoi-deltai: 57-71,
                                                                                                                 periodi: 14,
                                                                                                                                              taoPi SP-
                                                                           c_i: 3449733.
      deltaPi_SP: 57-60,
                                         periodPi: 3,
                                                                                                               dowork: 4745592,
                                                                                                                                                          fa i: 4
123
        Vessel i: 1: li: 4,
                                  pi: 22-26,
                                                          ai-di: 3-31,
                                                                                taoi-deltai: 3-29,
                                                                                                               periodi: 26,
                                                                                                                                            taoPi_SP-deltaPi_SP
                             periodPi: 6,
                                                               c_i: 6779551,
                                                                                                   dowork: 7909320,
     : 3-9,
                                                                                                                                              fa_i: 3
                                  pi: 22-29,
                                                                                                                 periodi: 25,
        Vessel i: 2:
                      li: 7,
                                                          ai-di: 41-68,
                                                                                  taoi-deltai: 41-66,
                                                                                                                                              taoPi_SP-
124
                                                                           c_i: 6529882,
                                         periodPi: 8,
     deltaPi_SP: 41-49,
                                                                                                               dowork: 6591100,
                                                                                                                                                          fa_i: 2
                                                                                                                                            taoPi_SP-deltaPi_SP
125
        Vessel i: 3:
                      li: 5,
                                  pi: 17-22,
                                                          ai-di: 9-38,
                                                                                taoi-deltai: 9-36,
                                                                                                               periodi: 27,
                                periodPi. 8,
                                                                 c_i: 6978953,
     : 9-17,
                                                                                                      dowork: 7250210,
                                                                                                                                                 fa i: 2
                                                        ai-di: 36-50,
                                                                                                               periodi: 8,
        Vessel i: 4:
                                                                                taoi-deltai: 36-44,
                                                                                                                                          taoPi SP-deltaPi SP:
126
                      li: 7,
                                  pi: 7-14,
                                                                 c_i: 1982554,
                                                                                                     dowork: 3559194,
     36-38,
                                periodPi: 2,
                                                                                                                                                 fa_i: 5
127
     TimeSolveModel: 75.000000
128
129 TimeAll: 78.000000
130
131
```