```
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=28201
 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_LW_0001/4 0000/3 python_code/9 Code for this
10
     Backend TkAgg is interactive backend. Turning interactive mode on.
11
     Waiting 5s.....
     Optimize the ./R 10 3.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 260882 rows, 80570 columns and 770550 nonzeros
25
26
     Model fingerprint: 0x4ae5559c
     Variable types: 0 continuous, 80570 integer (67900 binary)
     Coefficient statistics:
28
29
      Matrix range [1e+00, 5e+05]
      Objective range [1e+00, 1e+00]
      Bounds range
                          [1e+00, 1e+00]
31
      RHS range
                          [1e+00, 7e+06]
33
     Presolve removed 226198 rows and 3600 columns
     Presolve time: 0.19s
     Presolved: 34684 rows, 76970 columns, 101189 nonzeros
35
36
     Variable types: 0 continuous, 76970 integer (64310 binary)
     Root relaxation presolved: 34534 rows, 77015 columns, 100777 nonzeros
38
     Deterministic concurrent LP optimizer: primal and dual simplex
39
40
     Showing primal log only...
     Concurrent spin time: 0.02s
42
43
44
     Solved with dual simplex
45
     Root relaxation: objective 6.224695e+02, 3243 iterations, 0.34 seconds (0.37 work units)
46
47
48
        Nodes | Current Node | Objective Bounds
49
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
50
51
              0 622.46948 0 2375
                                                 - 622.46948
52
     H \quad 0 \quad 0
                                1027.0000000 622.46948 39.4% -
53
    Н
         0
                                1025.0000000 662.74155 35.3%
               0
54
     Η
                                1018.0000000 662.74155 34.9%
                                 0\ 1949\ 1018.00000\ 662.74155\ 34.9\%
              0 662.74155
56
              0 675.66111
                                 0 2316 1018.00000 675.66111 33.6%
                                                                                        85
57
              0 675.73487
                                 0 2042 1018.00000 675.73487 33.6%
58
         0
              0 675.73487
                                 0 2364 1018.00000 675.73487 33.6%
                                0 1855 1018.00000 679.72443 33.2%
              0 679.72443
60 H 0
               0
                                1016.0000000 680.14441 33.1%
61
              0 680.14441 0 2297 1016.00000 680.14441 33.1%
                                                                                     - 10s
              0 680.20196
                                0 2294 1016.00000 680.20196 33.1%
63
         0
              0 684.30990
                                0 1918 1016.00000 684.30990 32.6%
                                                                                     - 12s
              0 684 63537
                                 0 1915 1016.00000 684.63537 32.6%
64
         0
                                                                                    - 13s
65
              0 684.69497
                                 0 2056 1016.00000 684.69497 32.6%
                                                                                     - 13s
66
              0 684.71976
                                 0.2118\ 1016.00000\ 684.71976\ 32.6\%
                                                                                     - 13s
                                0 1662 1016.00000 686.47956 32.4%
              0 686.47956
                                                                                     - 14s
67
         0
68
         0
              0 686.84118
                                 0 1775 1016.00000 686.84118 32.4%
                                                                                     - 16s
69
         0
              0 686.87068
                                 0 1737 1016.00000 686.87068 32.4%
70
              0 687.18505
                                 0 1715 1016.00000 687.18505 32.4%
                                                                                     - 16s
71
                                 0 1751 1016 00000 687 22424 32 4%
                                                                                     - 18s
         0
              0 687 22424
72
         0
              0 687.46746
                                 0 1729 1016.00000 687.46746 32.3%
                                                                                     - 18s
              0 687.50132
                                 0 1724 1016.00000 687.50132 32.3%
74
              2 687.52544
                                0 1674 1016.00000 687.52544 32.3%
              34 688.66085 9 1684 1016.00000 688.57130 32.2% 131 41s
75
        30
       457
              466 693.65586 116 1740 1016.00000 688.57130 32.2% 22.7 45s
       1183 1215 703.13784 294 1510 1016.00000 688.57130 32.2% 37.0 50s
      2120 2175 723.00000 542 1163 1016.00000 688.57130 32.2% 57.6 55s
78
79
      2993 3009 797.00000 721 1086 1016.00000 688.57130 32.2% 68.1 60s
              3935 733.81811 22 1493 1016.00000 688.57242 32.2% 68.8 65s
80
      3871
```

```
5098 5292 764.72363 348 1188 1016.00000 688.57242 32.2% 58.4 70s
 81
     5512 4777 923.13203 923 17268 1016.00000 688.57242 32.2% 55.3 80s
     5514 4778 971.00000 763 1515 1016.00000 971.00000 4.43% 55.3 87s
     5515 4779 971.00000 852 1736 1016.00000 971.00000 4.43% 55.3 102s
     5516 4780 982.22559 1115 1887 1016.00000 982.22559 3.32% 55.3 112s
     5517 4780 982.99538 675 1784 1016.00000 982.99538 3.25% 55.3 120s
     5522 4784 986.00000 698 1959 1016.00000 986.00000 2.95% 55.2 135s
 87
 88
     5523 4784 986.07725 5 1817 1016.00000 986.07725 2.95% 55.2 140s
     5532 4790 986.30578 642 1673 1016.00000 986.30578 2.92% 55.1 148s
     5541 4796 986.66466 301 1830 1016.00000 986.66466 2.89% 55.1 150s
     5553 4804 986.90388 841 1686 1016.00000 986.90388 2.86% 54.9 156s
 91
 92
     5554 4805 986.90388 897 1777 1016.00000 986.90388 2.86% 54.9 164s
     5555 4806 987.04416 415 1783 1016.00000 987.04416 2.85% 54.9 165s
     5569 4815 987.04416 303 1738 1016.00000 987.04416 2.85% 54.8 196s
 94
 95
     5578 4821 987.51726 182 1754 1016.00000 987.51726 2.80% 54.7 201s
     5579 4822 987.51726 191 1748 1016.00000 987.51726 2.80% 54.7 212s
     5592 4830 987.67912 378 1771 1016.00000 987.67912 2.79% 54.6 216s
 98
     5593 4831 987.67912 775 1732 1016.00000 987.67912 2.79% 54.5 228s
 99
     5601 4836 987.86594 113 1708 1016.00000 987.86594 2.77% 54.5 230s
100
     5608 4841 987.86594 54 1717 1016.00000 987.86594 2.77% 54.4 245s
     5617 4847 988.14549 675 1726 1016.00000 988.14549 2.74% 54.3 251s
101
     5618 4848 988.14607 420 1662 1016.00000 988.14607 2.74% 54.3 265s
102
     5630 4856 988.20665 48 1684 1016.00000 988.20665 2.74% 54.2 286s
103
104
     5638 4861 988.27162 115 1712 1016.00000 988.27162 2.73% 54.1 290s
     5639 4862 988.27162 557 1656 1016.00000 988.27162 2.73% 54.1 299s
105
106
     5643 4864 988.35691 7 1684 1016.00000 988.35691 2.72% 54.1 300s
     5648 4868 988.39133 339 1705 1016.00000 988.39133 2.72% 54.0 316s
     5663 4878 988.56444 293 1694 1016.00000 988.56444 2.70% 53.9 320s
108
     5673 4884 988.56444 655 1741 1016.00000 988.56444 2.70% 53.8 327s
109
     5674 4885 988.59025 140 1664 1016.00000 988.59025 2.70% 53.8 351s
110
111
     5690 4896 988.81971 834 1713 1016.00000 988.81971 2.68% 53.6 359s
     5691 4896 988.86583 86 1643 1016.00000 988.86583 2.67% 53.6 377s
112
113
     5702 4904 988.96365 471 1696 1016.00000 988.96365 2.66% 53.5 380s
     5711 4910 988.99120 432 1660 1016.00000 988.99120 2.66% 53.4 406s
     5723 4918 989.08080 5 1706 1016.00000 989.08080 2.65% 53.3 411s
115
     5724\ 4918\ 989.08080\ 555\ 1658\ 1016.00000\ 989.08080\ 2.65\%\ 53.3\ 440s
116
117
     5725 4919 989.20954 80 1717 1016.00000 989.20954 2.64% 53.3 449s
     5726 4920 989.20954 1072 1693 1016.00000 989.20954 2.64% 53.3 450s
118
     5736 4926 989.20954 260 1676 1016.00000 989.20954 2.64% 53.2 465s
119
120
     5737 4927 989.20954 323 1904 1016.00000 989.20954 2.64% 53.2 507s
     5739 4928 989.25134 557 1777 1016.00000 989.25134 2.63% 53.2 510s
122
     5746 4933 989.25134 46 1898 1016.00000 989.25134 2.63% 53.1 515s
     5751 4936 989.25134 588 1899 1016.00000 989.25134 2.63% 53.0 529s
123
124
     5752 4937 989.25134 902 1819 1016.00000 989.25134 2.63% 53.0 589s
     5753 4938 989.35397 841 1810 1016.00000 989.35397 2.62% 53.0 591s
125
     5758 4941 989.37302 209 2021 1016.00000 989.37302 2.62% 53.0 595s
126
     5767 4947 989.38876 1194 2056 1016.00000 989.38876 2.62% 52.9 602s
127
128
     5768 4948 989.39058 721 1875 1016.00000 989.39058 2.62% 52.9 626s
     5778 4954 989.47870 182 1653 1016.00000 989.47870 2.61% 52.8 630s
     5785 4959 989.47870 561 2005 1016.00000 989.47870 2.61% 52.7 701s
130
     5797 4967 990.00000 21 1912 1016.00000 990.00000 2.56% 52.6 707s
131
     5798 4968 990.00000 412 1997 1016.00000 990.00000 2.56% 52.6 729s
     5799 4968 990.00000 329 1878 1016.00000 990.00000 2.56% 52.6 730s
133
     5811\ 4976\ 990.00000\ 432\ 1850\ 1016.00000\ 990.00000\ 2.56\%\ 52.5\ 736s
134
135
     5812 4977 990.00000 923 1901 1016.00000 990.00000 2.56% 52.5 752s
     5823 4984 990.00000 5 1706 1016.00000 990.00000 2.56% 52.4 760s
136
     5841 4996 990.00000 301 1940 1016.00000 990.00000 2.56% 52.2 765s
137
     5844 4998 990.00000 46 2077 1016.00000 990.00000 2.56% 52.2 788s
138
139
     5847 5000 990.00000 645 2099 1016.00000 990.00000 2.56% 52.2 790s
140
     5858 5008 990.00000 209 2132 1016.00000 990.00000 2.56% 52.1 795s
     5859 5008 990.00000 88 2007 1016.00000 990.00000 2.56% 52.1 809s
141
142
     5862 5010 990.00000 140 2161 1016.00000 990.00000 2.56% 52.0 810s
     5880 5022 990.00000 402 2194 1016.00000 990.00000 2.56% 51.9 817s
144
     5881 5023 990.00000 342 1887 1016.00000 990.00000 2.56% 51.9 853s
     5885 5026 991.00000 561 2107 1016.00000 991.00000 2.46% 51.8 855s
145
     5898 5034 991.00000 412 2160 1016.00000 991.00000 2.46% 51.7 864s
146
147
     5899 5035 991.00000 329 1962 1016.00000 991.00000 2.46% 51.7 914s
     5900 5036 991.00000 235 2121 1016.00000 991.00000 2.46% 51.7 916s
148
149
     5905 5039 991.00000 454 2127 1016.00000 991.00000 2.46% 51.7 920s
     5916 5046 991.00000 1115 2151 1016.00000 991.00000 2.46% 51.6 943s
150
     5917 5047 991.00000 675 2034 1016.00000 991.00000 2.46% 51.6 990s
151
152
     5923 5051 991.00000 5 2186 1016.00000 991.00000 2.46% 51.5 995s
153
     5931 5056 991.00000 874 2197 1016.00000 991.00000 2.46% 51.4 1017s
     5932 5057 991.00000 642 2129 1016.00000 991.00000 2.46% 51.4 1055s
155
     5955 5072 991.00000 415 2201 1016.00000 991.00000 2.46% 51.2 1064s
     5957 5074 991.00000 655 2122 1016.00000 991.00000 2.46% 51.2 1065s
156
157
     5974 5085 991.00000 140 2179 1016.00000 991.00000 2.46% 51.1 1073s
158
     5975 5086 991.00000 1155 1994 1016.00000 991.00000 2.46% 51.1 1086s
     5989 5095 991.00000 280 2191 1016.00000 991.00000 2.46% 50.9 1090s
159
160
     5998 5101 991.00000 412 2202 1016.00000 991.00000 2.46% 50.9 1096s
     5999 5102 991.00000 329 2127 1016.00000 991.00000 2.46% 50.9 1132s
161
     6005 5106 991.00000 454 2146 1016.00000 991.00000 2.46% 50.8 1135s
162
     6019 5115 991.00000 190 2180 1016.00000 991.00000 2.46% 50.7 1146s
163
     6020 5116 991.00000 246 2083 1016.00000 991.00000 2.46% 50.7 1193s
164
```

```
unknown
165
       6026 5120 991.00000 1072 2137 1016.00000 991.00000 2.46% 50.6 1195s
166
167
      Cutting planes:
168
       Learned: 110
169
       Implied bound: 6
170
       MIR: 380
       Mixing: 1
171
172
       Flow cover: 1073
       Zero half: 3
173
       RLT: 2
174
       Relax-and-lift: 2593
175
176
177
      Explored 6040 nodes (480952 simplex iterations) in 1200.83 seconds (960.59 work units)
178
     Thread count was 8 (of 8 available processors)
179
180
     Solution count 3: 1016 1018 1025
181
     Time limit reached
182
183 Best objective 1.016000000000e+03, best bound 9.91000000000e+02, gap 2.4606%
184
185
     Output one feasible solution with limited computation time
186
187
      Optimization was stopped with status 9
188
189 Number of solution stored: 3
190
        1016 1018 1025
191
192 Obj = 1016.0
193
194 Solutions:
195
         The total pi = 172.0
196
         The total duration time in berth stage = 202.0
197
         The total duration time in quay crane scheduling stage = 52.0
198
         The total departure time in berth stage= 583.0
199
         The total departure time in quay crane scheduling stage = 433.0
200
         The total wasted crane work hour according QC0= 15.432507472197358
201
         The last depature time in quay crane scheduling stage = 68.0
202
203 The specific solution are as follows:
                                    pi: 29-34,
204
        Vessel i: 0:
                       li: 5,
                                                             ai-di: 48-67,
                                                                                      taoi-deltai: 48-67,
                                                                                                                      periodi: 19,
                                                                                                                                                    taoPi_SP-
      deltaPi_SP: 48-54,
                                           periodPi: 6,
                                                                              c i: 4999375,
                                                                                                                    dowork: 5536524,
                                                                                                                                                                 fa_i: 2
205
        Vessel i: 1:
                       li: 4,
                                    pi: 24-28,
                                                             ai-di: 17-29,
                                                                                      taoi-deltai: 17-29,
                                                                                                                      periodi: 12,
                                                                                                                                                    taoPi SP-
      deltaPi_SP: 17-19,
                                           periodPi: 2,
                                                                                                                    dowork: 3163728.
                                                                                                                                                                 fa_i: 4
                                                                               c i: 2974108.
206
         Vessel i: 2:
                       li: 7,
                                    pi: 22-29,
                                                             ai-di: 43-62,
                                                                                      taoi-deltai: 43-62,
                                                                                                                      periodi: 19,
                                                                                                                                                    taoPi SP-
      deltaPi_SP: 43-46,
                                           periodPi: 3,
                                                                                                                    dowork: 6854744,
                                                                              c_i: 4775116,
                                                                                                                                                                 fa_i: 7
                                                                                                                                                  taoPi SP-deltaPi_SP
207
                                    pi: 14-19,
                                                             ai-di: 5-31,
                                                                                                                    periodi: 26,
        Vessel i: 3:
                       li: 5,
                                                                                   taoi-deltai: 5-31,
                                                                    c_i: 6615975,
                                 periodPi: 10,
                                                                                                          dowork: 6854744,
      : 5-15,
                                                                                                                                                       fa_i: 2
208
        Vessel i: 4:
                       li: 7,
                                    pi: 7-14,
                                                           ai-di: 29-47,
                                                                                    taoi-deltai: 29-47,
                                                                                                                    periodi: 18,
                                                                                                                                                  taoPi_SP-deltaPi_SP
                                 periodPi: 5,
                                                                    c i: 4538343,
      : 29-34,
                                                                                                          dowork: 4613770,
                                                                                                                                                       fa i: 2
                                    pi: 5-12.
                                                          ai-di: 61-83,
209
        Vessel i: 5:
                                                                                                                    periodi: 21,
                                                                                                                                                  taoPi_SP-deltaPi_SP
                       li: 7.
                                                                                   taoi-deltai: 61-82.
       61-65,
                                  periodPi: 4.
                                                                    c i: 5372244,
                                                                                                          dowork: 5404702,
                                                                                                                                                       fa i: 6
210
                                   pi: 19-24,
                                                             ai-di: 5-31,
                                                                                   taoi-deltai: 5-27,
                                                                                                                                                  taoPi_SP-deltaPi_SP
        Vessel i: 6:
                       li: 5.
                                                                                                                    periodi: 22,
      : 5-10,
                                                                    c i: 5722539,
                                                                                                          dowork: 5800168,
                                 periodPi: 5.
                                                                                                                                                       fa i: 3
        Vessel i: 7:
                                                                                      taoi-deltai: 61-87,
                                                                                                                      periodi: 26,
                                                                                                                                                    taoPi_SP-
                       li: 6,
                                    pi: 12-18,
                                                             ai-di: 61-83,
      deltaPi_SP: 61-68,
                                           periodPi: 7,
                                                                               c i: 6601917,
                                                                                                                    dowork: 6722922,
                                                                                                                                                                 fa_i: 3
        Vessel i: 8:
                       li: 7,
                                    pi: 22-29,
                                                             ai-di: 65-83,
                                                                                      taoi-deltai: 65-77,
                                                                                                                      periodi: 12,
                                                                                                                                                    taoPi SP-
      deltaPi SP: 65-67,
                                                                                                                    dowork: 3163728,
                                           periodPi: 2,
                                                                              c i: 2902377,
                                                                                                                                                                 fa i: 4
213
                                    pi: 18-22,
                                                                                                                                                    taoPi_SP-
        Vessel i: 9:
                       li: 4,
                                                             ai-di: 47-79,
                                                                                      taoi-deltai: 47-74,
                                                                                                                      periodi: 27,
      deltaPi_SP: 47-55,
                                           periodPi: 8,
                                                                              c_i: 6926380,
                                                                                                                    dowork: 7382032,
                                                                                                                                                                 fa_i: 3
     TimeSolveModel: 1211.000000
215
216
     TimeAll: 1215.000000
217
218
```