```
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=8146
 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 7 8.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 133301 rows, 56000 columns and 390789 nonzeros
25
26
     Model fingerprint: 0xe3be7d77
      Variable types: 0 continuous, 56000 integer (47131 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 108682 rows and 2349 columns
     Presolve time: 0.18s
     Presolved: 24619 rows, 53651 columns, 71717 nonzeros
35
36
      Variable types: 0 continuous, 53651 integer (44789 binary)
     Root relaxation: objective 3.477407e+02, 2355 iterations, 0.11 seconds (0.30 work units)
38
39
40
         Nodes | Current Node | Objective Bounds
41
      Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
42
43
                0 347.74067 0 1820
                                                          - 347.74067
44
     Η
          0
                  0
                                       900.0000000 347.74067 61.4%
45
    Η
          0
                 0
                                       568.0000000 347.74067 38.8%
                0 360.43256
46
          0
                                       0 1815 568.00000 360.43256 36.5%
                                                                                                       2s
47
                0 374.00000
                                      0 1792 568.00000 374.00000 34.2%
                                                                                                       10s
                0\ \ 374.00000\ \ \ 0\ 1820\ \ 568.00000\ \ 374.00000\ \ 34.2\%
48
49
                                     0 1499 568.00000 374.00000 34.2%
          0
                0 374.00000
                                                                                                       10s
50
          0
                0.376.00000
                                     0 1764 568.00000 376.00000 33.8%
                                                                                                   - 19s
51
                0 376.00000
                                      0 1763 568.00000 376.00000 33.8%
                                                                                                   - 19s
52
                0 376.00000
                                     0 1289 568.00000 376.00000 33.8%
                                                                                                      21s
53
                0 376.96099
                                      0 1663 568.00000 376.96099 33.6%
                                                                                                      23s
          0
54
                0 377.66023
                                       0 1452 568.00000 377.66023 33.5%
                                                                                                      23s
                                       0\ 1452\ 568.00000\ 377.69826\ 33.5\%
55
                0 377.69826
                                                                                                      23s
56
                0 377.70409
                                      0 1453 568.00000 377.70409 33.5%
                                                                                                      238
          0
                0 378.67796
57
          0
                                       0 1539 568.00000 378.67796 33.3%
                                                                                                      249
58
          0
                0 379.74010
                                       0 1585 568.00000 379.74010 33.1%
                                                                                                      28s
                0 379,79076
                                     0 1585 568.00000 379.79076 33.1%
60
                0 379.81872
                                      0 1622 568.00000 379.81872 33.1%
                                                                                                      28s
          0
61
          0
                0 379.82132
                                       0 1622 568.00000 379.82132 33.1%
                                                                                                      28s
                0 379.98516
                                       0 1317 568.00000 379.98516 33.1%
                                                                                                      29s
63
          0
                0 380.03971
                                       0 1576 568.00000 380.03971 33.1%
                                                                                                      30s
                0 380 04774
                                       0 1491 568 00000 380 04774 33 1%
                                                                                                      30s
64
          0
                                                                                                      31s
65
                0.380.41147
                                       0 1472 568.00000 380.41147 33.0%
66
                0 380.74402
                                       0 1556 568.00000 380.74402 33.0%
                                                                                                      36s
                                       0 1567 568.00000 380.75433 33.0%
                0 380.75433
                                                                                                      36s
67
          0
                                       0 1418 568.00000 381.00427 32.9%
68
          0
                0 381.00427
                                                                                                      36s
69
          0
                0 381.08152
                                       0 1546 568.00000 381.08152 32.9%
                                                                                                      42s
70
                0 381.09731
                                       0 1529 568.00000 381.09731 32.9%
                                                                                                      42s
                                       0.1490 568 00000 382 21075 32 7%
71
                0.382.21075
                                                                                                      42s
          0
72
          0
                0 382.78088
                                       0 1573 568.00000 382.78088 32.6%
                                                                                                      48s
                0 382.83541
                                       0 1580 568.00000 382.83541 32.6%
                                                                                                      48s
74
          0
                0 382.87716
                                       0 1581 568.00000 382.87716 32.6%
                                                                                                      48s
                                       0 1581 568.00000 382.87844 32.6%
75
          0
                0 382.87844
                                                                                                   - 48s
76
                0 383.13232
                                       0 1540 568.00000 383.13232 32.5%
                                                                                                      49s
                0 383.17900
                                       0 1551 568.00000 383.17900 32.5%
                                                                                                      56s
                0 383.18062
                                      0 1551 568.00000 383.18062 32.5%
78
          0
                                                                                                      56s
                                       0 1465 568.00000 383.39703 32.5%
79
          0
                0 383.39703
                                                                                                      56s
80
          0
                0 383.40335
                                       0 1455 568.00000 383.40335 32.5%
                                                                                                      57s
```

```
2 383.40335  0 1451 568.00000 383.40335 32.5%
81
82
          28 384.48220 7 1511 568.00000 383.61230 32.5% 141 73s
          371 386.04700 88 1433 568.00000 383.61230 32.5% 14.8 75s
83
      362
84
     1999 2049 398.64186 492 1135 568.00000 383.61230 32.5% 8.1 80s
     2791 2817 452.69518 682 934 568.00000 383.61230 32.5% 31.4
     3201 3129 436.79966 89 1455 568.00000 384.24682 32.4% 36.0
86
     3204 3131 541 00000 588 99 568 00000 541 00000 4 75% 35 9 101s
87
     3207 3133 542.60937 375 339 568.00000 542.60937 4.47% 35.9 105s
     3214 3138 547.19211 557 674 568.00000 547.19211 3.66% 35.8 110s
     3223 3144 552.10654 172 530 568.00000 552.10654 2.80% 35.7 116s
     3226 3146 553 71201 464 333 568 00000 553 71201 2 52% 35 7 120s
91
92
     3235 3152 554.43232 218 439 568.00000 554.43232 2.39% 35.6 127s
     3244 3158 555.50326 650 581 568.00000 555.50326 2.20% 35.5 130s
94
     3249 3161 555.71787 36 480 568.00000 555.71787 2.16% 35.4 137s
95
     3252 3163 555.86092 116 482 568.00000 555.86092 2.14% 35.4 142s
     3255 3165 555.95807 620 518 568.00000 555.95807 2.12% 35.4 151s
     3258 3167 556.10610 225 483 568.00000 556.10610 2.09% 35.3 180s
98
     3261 3169 556 10771 15 458 568 00000 556 10771 2 09% 35 3 1858
     3262 3170 556.27416 451 501 568.00000 556.27416 2.06% 35.3 196s
100
     3266 3172 556.31067 64 483 568.00000 556.31067 2.06% 35.2 200s
     3267 3173 556.46508 682 526 568.00000 556.46508 2.03% 35.2 212s
101
     3269 3174 556.52006 113 500 568.00000 556.52006 2.02% 35.2 215s
102
     3273 3177 556.68014 210 486 568.00000 556.68014 1.99% 35.2
103
104
     3274 3178 556.73835 336 533 568.00000 556.73835 1.98% 35.2 230s
     3278 3180 556.77856 410 532 568.00000 556.77856 1.98% 35.1 235s
105
106
     3279 3181 557.17279 114 538 568.00000 557.17279 1.91% 35.1 251s
     3281 3182 557.34167 505 571 568.00000 557.34167 1.88% 35.1 256s
     3285 3185 557.53376 349 537 568.00000 557.53376 1.84% 35.0 274s
108
     3286 3186 557.56659 110 533 568.00000 557.56659 1.84% 35.0 278s
109
110
     3289 3188 557.59355 119 521 568.00000 557.59355 1.83% 35.0 280s
111
     3290 3188 557.70187 288 487
                                   568.00000 557.70187 1.81% 35.0 292s
     3293 3190 557.74688 700 500 568.00000 557.74688 1.81% 35.0 295s
112
113
     3295 3192 557.88219 599 468 568.00000 557.88219 1.78% 34.9 304s
     3296 3192 557.96072 53 535 568.00000 557.96072 1.77% 34.9 306s
115
     3301 3196 558.07287 89 505 568.00000 558.07287 1.75% 34.9 323s
     3302 3196 558.09806 435 470 568.00000 558.09806 1.74% 34.9 329s
116
117
     3303 3197 558.10800 287 521 568.00000 558.10800 1.74% 34.8 331s
118
     3306 3199 558.15294 244 532 568.00000 558.15294 1.73% 34.8 355s
     3307 3200 558.16721 375 542 568.00000 558.16721 1.73% 34.8 364s
119
120
     3308 3200 558.17634 597 513 568.00000 558.17634 1.73% 34.8 370s
     3310 3202 558.18373 299 522 568.00000 558.18373 1.73% 34.8 379s
121
122
     3311 3202 558.20883 448 482 568.00000 558.20883 1.72% 34.8 425s
     3315 3205 558 24548 563 476 568 00000 558 24548 1 72% 34 7 431s
123
124
     3319 3208 558.28011 282 497 568.00000 558.28011 1.71% 34.7 436s
     3328 3215 558.31296 56 219 568.00000 558.31296 1.71% 66.5 440s
125
     3368 3244 564.52448 670 94 568.00000 564.52448 0.61% 66.9 445s
126
                              568.00000 566.00000 0.35% 70.4 450s
127
     3486 3251
                 cutoff 49
128
129 Cutting planes:
130
     Learned: 1
131
     Gomory: 9
     Lift-and-project: 17
133
     Cover: 2
     Implied bound: 3
134
135
     MIR: 25
     StrongCG: 4
136
137
     Flow cover: 44
138
     Zero half: 6
139
     RLT: 8
140
     Relax-and-lift: 89
141
142
    Explored 3588 nodes (271220 simplex iterations) in 451.22 seconds (267.55 work units)
   Thread count was 8 (of 8 available processors)
144
145
    Solution count 3: 568 568 568
146 No other solutions better than 568
147
148 Optimal solution found (tolerance 1.00e-04)
149 Best objective 5.680000000000e+02, best bound 5.68000000000e+02, gap 0.0000%
150
151 Output optimal solution and the Optimal Obj: 568.0
152
153
154 \text{ Obj} = 568.0
155
156 Solutions:
157
       The total pi = 122.0
158
       The total duration time in berth stage = 122.0
159
       The total duration time in quay crane scheduling stage = 28.0
160
       The total departure time in berth stage= 331.0
161
       The total departure time in quay crane scheduling stage = 237.0
       The total wasted crane work hour according QC0= 12.944538847840269
162
163
       The last depature time in quay crane scheduling stage = 51.0
164
```

unkno	JWII						
165	The specific solution are as follows:						
166	Vessel i: 0:	li: 6,	pi: 28-34,	ai-di: 24-33,	taoi-deltai: 24-33,	periodi: 9,	taoPi_SP-deltaPi_SP
	: 24-26,		periodPi: 2,	ai-di: 24-33, taoi-deltai: 24-33, c_i: 2148120, ai-di: 28-41, c_i: 3207287, ai-di: 24-44, c_i: 5157909, ai-di: 48-67, c_i: 4844899, ai-di: 44-56, taoi-deltai: 44-54, c_i: 2392061, ai-di: 28-60, c_i: 6496954		dowork: 2240974,	fa_i: 4
167	Vessel i: 1:	li: 5,	pi: 23-28,	ai-di: 28-41,	taoi-deltai: 28-41,	periodi: 13,	taoPi_SP-
	deltaPi_SP: 28-31,		periodPi: 3,		c_i: 3207287,	dowork: 3822838,	fa_i: 3
168	Vessel i: 2:	li: 4,	pi: 14-18,	ai-di: 24-44,	taoi-deltai: 24-44,	periodi: 20,	taoPi_SP-
	deltaPi_SP: 24-28,		periodPi: 4,	c_i: 5157909,		dowork: 5272880,	fa_i: 4
169	Vessel i: 3:	li: 7,	pi: 7-14,	ai-di: 48-67,	taoi-deltai: 48-67,	periodi: 19,	taoPi_SP-deltaPi_SP
	: 48-51,		periodPi: 3,	c_i: 484	14899,	dowork: 5536524,	fa_i: 5
170	Vessel i: 4:	li: 7,	pi: 23-30,	ai-di: 44-56,	taoi-deltai: 44-54,	periodi: 10,	taoPi_SP-
	deltaPi_SP: 44-46,		periodPi: 2,	c_i: 2392061,		dowork: 2636440,	fa_i: 3
171	Vessel i: 5:	li: 5,	pi: 18-23,	ai-di: 28-60,	taoi-deltai: 28-53,	periodi: 25,	taoPi_SP-
172	Vessel i: 6:	li: 5,	pi: 9-14,	ai-di: 13-47,	taoi-deltai: 13-39,	periodi: 26,	taoPi SP-deltaPi SP
	: 13-18,		periodPi: 5,	c_i: 6745562,		dowork: 7909320,	fa_i: 4
173	3 TimeSolveModel: 459.000000						
174							
175	TimeAll: 462.00	00000					
176							
177							