```
 1  "E:\1 □□□□\3 □□□□□\1 □□□□□□□\1 □□□□□□□□\1_□□□□□□_□□□□\1_LW _□□□□\4 □□□□\3 python_code\1 exzample\2 □□□□□□\9 Code for
    this paper\Scripts\python.exe" "D:\Python\Pycharm\setroute\PyCharm Community Edition 2021.2.3\plugins\python-ce\helpers\pydev\pydevconsole.py" --mode=
    client --port=21758
 2
 3  import sys; print('Python %s on %s' % (sys.version, sys.platform))
 4  sys.path.extend(['E:\\1 □□□□\\3 □□□□□\\1 □□□□□□□\\1 □□□□□□□□\\1_□□□□□□_□□□□\\1_LW _□□□□\\4 □□□□\\3 python_code\\9 Code for this
    paper', 'E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper'])
 5
 6  PyDev console: starting.
 7
 8  Python 3.9.7 (tags/v3.9.7:1016ef3, Aug 30 2021, 20:19:38) [MSC v.1929 64 bit (AMD64)] on win32
 9  >>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper/
    main_DM.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this
    paper')
10  Backend TkAgg is interactive backend. Turning interactive mode on.
11  Waiting 5s......
12
13  Optimize the ./R_8_1.xlsx instance
14
15  Set parameter TimeLimit to value 1200
16
17  Set parameter PoolSolutions to value 3
18  Set parameter PoolGap to value 0.05
19  Set parameter PoolSearchMode to value 2
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]
23  Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
24
25  Optimize a model with 171112 rows, 64136 columns and 503224 nonzeros
26  Model fingerprint: 0x0c0c3fca
27  Variable types: 0 continuous, 64136 integer (54000 binary)
28  Coefficient statistics:
29   Matrix range     [1e+00, 5e+05]
30   Objective range  [1e+00, 1e+00]
31   Bounds range     [1e+00, 1e+00]
32   RHS range        [1e+00, 7e+06]
33  Presolve removed 144075 rows and 2767 columns
34  Presolve time: 0.28s
35  Presolved: 27037 rows, 61369 columns, 78667 nonzeros
36  Variable types: 0 continuous, 61369 integer (51241 binary)
37
38  Root relaxation: objective 3.011068e+02, 2771 iterations, 0.13 seconds (0.32 work units)
39
40      Nodes    |    Current Node    |     Objective Bounds     |     Work
41   Expl Unexpl |  Obj  Depth IntInf | Incumbent    BestBd   Gap | It/Node Time
42
43      0    0  301.10677    0 2004       - 301.10677    -    -    0s
44  H   0    0               476.0000000 301.10677 36.7%    -    2s
45  H   0    0               474.0000000 301.10677 36.5%    -    2s
46      0    0  315.42339    0 1902  474.00000 315.42339 33.5%    -    3s
47  H   0    0               473.0000000 319.92546 32.4%    -   11s
48      0    0  319.92546    0 1866  473.00000 319.92546 32.4%    -   11s
49      0    0  320.07261    0 2007  473.00000 320.07261 32.3%    -   11s
50      0    0  320.07261    0 2007  473.00000 320.07261 32.3%    -   11s
51      0    0  322.73620    0 1714  473.00000 322.73620 31.8%    -   11s
52      0    0  323.23023    0 1939  473.00000 323.23023 31.7%    -   19s
53      0    0  323.24880    0 1938  473.00000 323.24880 31.7%    -   19s
54      0    0  326.48663    0 1666  473.00000 326.48663 31.0%    -   21s
55      0    0  327.12409    0 1611  473.00000 327.12409 30.8%    -   24s
56      0    0  327.14758    0 1680  473.00000 327.14758 30.8%    -   24s
57      0    0  327.14758    0 1639  473.00000 327.14758 30.8%    -   24s
58      0    0  328.50660    0 1666  473.00000 328.50660 30.5%    -   25s
59      0    0  328.62719    0 1540  473.00000 328.62719 30.5%    -   33s
60      0    0  328.63176    0 1627  473.00000 328.63176 30.5%    -   33s
61      0    0  328.76812    0 1316  473.00000 328.76812 30.5%    -   34s
62      0    0  328.83401    0 1599  473.00000 328.83401 30.5%    -   39s
63      0    0  328.83706    0 1605  473.00000 328.83706 30.5%    -   39s
64      0    0  329.33914    0 1416  473.00000 329.33914 30.4%    -   40s
65      0    0  329.36743    0 1422  473.00000 329.36743 30.4%    -   45s
66      0    0  329.36743    0 1427  473.00000 329.36743 30.4%    -   45s
67      0    0  329.62693    0 1354  473.00000 329.62693 30.3%    -   46s
68      0    0  329.64210    0 1350  473.00000 329.64210 30.3%    -   46s
69      0    2  337.00000    0 1350  473.00000 337.00000 28.8%    -   53s
70    191  200  337.00000   45 1338  473.00000 337.00000 28.8% 13.1  55s
71   1607 1680  351.85037  398 1136  473.00000 337.00000 28.8% 12.7  60s
72   2530 2555  363.00000  602  719  473.00000 337.00000 28.8% 46.9  65s
73   3199 3212  395.00000  802  531  473.00000 337.00000 28.8% 73.4  70s
74   4091 4085  337.00000    5 1330  473.00000 337.00000 28.8% 82.6  75s
75   5145 4999  377.40861  168 1350  473.00000 337.00000 28.8% 80.0  86s
76   5148 5001  444.00000  257  157  473.00000 444.00000 6.13% 79.9  94s
77   5150 5002  445.00000   50  171  473.00000 445.00000 5.92% 79.9  98s
78   5151 5003  446.00000  120  260  473.00000 446.00000 5.71% 79.9 100s
79   5156 5006  448.90824  164  812  473.00000 448.90824 5.09% 79.8 105s
```

```
80    5158  5008  452.00285  24   540   473.00000  452.00285  4.44%  79.8  131s
81    5164  5012  453.32791  641  778   473.00000  453.32791  4.16%  79.7  135s
82    5165  5012  455.24920  230  418   473.00000  455.24920  3.75%  79.6  140s
83    5167  5014  456.24613  595  328   473.00000  456.24613  3.54%  79.6  146s
84    5172  5017  456.42622  787  489   473.00000  456.42622  3.50%  79.5  155s
85    5174  5018  456.49757  625  469   473.00000  456.49757  3.49%  79.5  162s
86    5175  5019  456.49757  618  482   473.00000  456.49757  3.49%  79.5  166s
87    5179  5023  456.73119  347  1350  473.00000  456.73119  3.44%  90.3  170s
88    5182  5025  458.48223  418  219   473.00000  458.48223  3.07%  90.3  177s
89    5187  5028  459.69347  211  564   473.00000  459.69347  2.81%  90.2  181s
90    5191  5031  461.18967  335  531   473.00000  461.18967  2.50%  90.1  186s
91  H 5194  4781              472.0000000  462.29866  2.06%  90.1  200s
92    5197  4783  462.37100  573  510   472.00000  462.37100  2.04%  90.0  205s
93    5199  4784  462.48495  486  413   472.00000  462.48495  2.02%  90.0  213s
94    5201  4786  462.56306  217  399   472.00000  462.56306  2.00%  89.9  217s
95    5202  4786  462.56306  380  399   472.00000  462.56306  2.00%  89.9  220s
96    5232  4789  466.10831  32   141   472.00000  464.18234  1.66%  94.2  225s
97    5365  4829  467.00000  51   77    472.00000  464.21180  1.65%  96.0  230s
98    5499  4894  infeasible  71        472.00000  464.21180  1.65%  98.0  235s
99    5676  4925  468.00000  103  49    472.00000  464.21180  1.65%  99.0  240s
100   5931  4402  467.00000  33   83    472.00000  465.09722  1.46%  98.1  246s
101   6108  4466  466.00000  48   91    472.00000  465.09722  1.46%  97.6  250s
102   6364  4621  466.00000  71   84    472.00000  465.09722  1.46%  95.4  255s
103   6567  4675  467.00000  91   65    472.00000  465.09722  1.46%  94.7  260s
104   6747  4865  466.00000  41   111   472.00000  466.00000  1.27%  94.0  266s
105   7075  5024  468.00000  113  96    472.00000  466.00000  1.27%  93.2  272s
106   7598  4997  467.12069  117  61    472.00000  466.00000  1.27%  90.6  278s
107   7965  5060  467.00000  110  61    472.00000  466.00000  1.27%  90.4  283s
108   8399  5064  469.00000  108  38    472.00000  466.00000  1.27%  90.7  288s
109   8765  5106  470.18605  84   73    472.00000  466.00000  1.27%  90.8  294s
110   9102  5100  466.00000  77   96    472.00000  466.00000  1.27%  91.7  300s
111   9442  5056  467.00000  86   56    472.00000  466.00000  1.27%  91.5  305s
112   10429 5015  468.00000  95   1350  472.00000  466.00000  1.27%  94.0  310s
113  H10434 4767              471.0000000  466.00000  1.06%  94.0  312s
114   10444 4775  infeasible  33        471.00000  466.00000  1.06%  94.8  315s
115  H10690 4616              470.0000000  467.00000  0.64%  94.8  317s
116
117  Cutting planes:
118    Gomory: 27
119    Lift-and-project: 9
120    Cover: 2
121    Implied bound: 7
122    MIR: 56
123    StrongCG: 8
124    Flow cover: 254
125    Zero half: 23
126    RLT: 15
127    Relax-and-lift: 444
128    BQP: 4
129
130  Explored 10948 nodes (1037778 simplex iterations) in 318.02 seconds (212.63 work units)
131  Thread count was 8 (of 8 available processors)
132
133  Solution count 3: 470 470 470
134  No other solutions better than 470
135
136  Optimal solution found (tolerance 1.00e-04)
137  Best objective 4.700000000000e+02, best bound 4.700000000000e+02, gap 0.0000%
138
139  Output optimal solution and the Optimal Obj:  470.0
140
141
142  Obj = 470.0
143
144  Solutions:
145      The total pi =  151.0
146      The total duration time in berth stage =  141.0
147      The total duration time in quay crane scheduling stage =  37.0
148      The total departure time in berth stage=  287.0
149      The total departure time in quay crane scheduling stage =  183.0
150      The total wasted crane work hour according QC0=  4.606435192911653
151      The last depature time in quay crane scheduling stage =  52.0
152
153  The specific solution are as follows:
```

154   Vessel i: 0: l_i: 6, p_i: 21-27, a_i-d_i: 1-12, tao_i-$delta_i$: 1-12, $period_i$: 11, $taoPi\_SP$-$deltaPi\_SP$: 1-5, $periodPi$: 4, c_i: 2838079,   dowork: 2900084, fa_i: 2

155   Vessel i: 1: l_i: 7, p_i: 27-34, a_i-d_i: 3-24, tao_i-$delta_i$: 3-23, $period_i$: 20, $taoPi\_SP$-$deltaPi\_SP$: 3-7, $periodPi$: 4, c_i: 5225121,   dowork: 5272880, fa_i: 3

156   Vessel i: 2: l_i: 6, p_i: 8-14, a_i-d_i: 13-40, tao_i-$delta_i$: 13-37, $period_i$: 24, $taoPi\_SP$-$deltaPi\_SP$: 13-17, $periodPi$: 4, c_i: 6204790,   dowork: 6327456, fa_i: 4

157   Vessel i: 3: l_i: 5, p_i: 3-8, a_i-d_i: 14-24, tao_i-$delta_i$: 14-26, $period_i$: 12, $taoPi\_SP$-$deltaPi\_SP$: 14-18, $periodPi$: 4, c_i: 2990355,   dowork: 3163728, fa_i: 3

158   Vessel i: 4: l_i: 6, p_i: 14-20, a_i-d_i: 18-34, tao_i-$delta_i$: 18-37, $period_i$: 19, $taoPi\_SP$-$deltaPi\_SP$: 18-24, $periodPi$: 6, c_i: 4876117,   dowork: 5141058, fa_i: 2

159	Vessel i: 5:	li: 7,	pi: 21-28,	ai-di: 24-50,	taoi-deltai: 24-51,	periodi: 27,	taoPi_SP-	
	deltaPi_SP: 24-31,		periodPi: 7,		c_i: 6856681,	dowork: 7250210,		fa_i: 3
160	Vessel i: 6:	li: 5,	pi: 29-34,	ai-di: 25-43,	taoi-deltai: 25-39,	periodi: 14,	taoPi_SP-	
	deltaPi_SP: 25-29,		periodPi: 4,		c_i: 3585255,	dowork: 3691016,		fa_i: 2
161	Vessel i: 7:	li: 6,	pi: 28-34,	ai-di: 48-62,	taoi-deltai: 48-62,	periodi: 14,	taoPi_SP-	
	deltaPi_SP: 48-52,		periodPi: 4,		c_i: 3514769,	dowork: 3559194,		fa_i: 2
162	TimeSolveModel: 326.000000							
163								
164	TimeAll: 330.000000							
165								
166								