```
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=46313
 3
     import sys; print('Python %s on %s' % (sys.version, sys.platform))
     sys.path.extend(|'E:\\1 000\\3 0000\\1 00000\\1 000000\\1 00000\\1 LW 0000\\4 0000\\3 python code\\9 Code for this
     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
     >>> runfile('E:/1 000/3 0000/1 00000/1 00000/1 00000/1 00000/1 LW_000/4 000/3 python_code/9 Code for this paper/main_RO_BDC.py', wdir='E:/1 0000/3 0000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 00000/1 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 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 00
     this paper')
     Backend TkAgg is interactive backend. Turning interactive mode on.
     Waiting 5s.....
     Set parameter MIPGap to value 1e-10
12
     Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
13
15
     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
16
17
     Optimize a model with 595616 rows, 58701 columns and 1673824 nonzeros
19
     Model fingerprint: 0x9be0b769
     Variable types: 1 continuous, 58700 integer (58660 binary)
20
21
     Coefficient statistics:
      Matrix range [1e+00, 1e+10]
       Objective range [1e+00, 2e+01]
23
24
       Bounds range [1e+00, 1e+00]
                            [1e+00, 2e+10]
       RHS range
26
      Warning: Model contains large matrix coefficients
27
     Warning: Model contains large rhs
28
             Consider reformulating model or setting NumericFocus parameter
29
             to avoid numerical issues.
     Presolve removed 343704 rows and 26015 columns (presolve time = 5s) ...
30
     Presolve removed 473248 rows and 39092 columns
31
     Presolve time: 9.64s
     Presolved: 122368 rows, 19609 columns, 331758 nonzeros
      Variable types: 0 continuous, 19609 integer (19579 binary)
34
35
     Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
     Showing first log only...
37
38
39
     Root relaxation presolved: 19609 rows, 141977 columns, 351367 nonzeros
40
41
42
     Root simplex log...
43
44
     Iteration Objective
                                      Primal Inf. Dual Inf.
           0 7.4300000e+02 0.000000e+00 1.027000e+03
45
                                                                                    11s
46
     Concurrent spin time: 0.02s
48
     Solved with dual simplex (primal model)
49
50
     Root relaxation: objective 7.430000e+02, 2874 iterations, 0.53 seconds (0.54 work units)
51
52
         Nodes | Current Node | Objective Bounds
                                                                               Work
53
      Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
54
          0 \quad \  0 \quad 743.00000 \quad \  0 \quad 16
55
                                                    - 743.00000
                                    823.0000000 743.00000 9.72% - 12s
56
     H \quad 0 \quad 0
57
          0 0 743.00000 0 55 823.00000 743.00000 9.72% - 12s
          0 0 743.00000 0 2 823.00000 743.00000 9.72% - 16s
59
         0 0 743.00000 0 28 823.00000 743.00000 9.72% - 17s
60 H 0 0
                                    743.0000000 743.00000 0.00% - 17s
          0
              0 743.00000 0 29 743.00000 743.00000 0.00% - 17s
62
63
     Cutting planes:
64
       Gomory: 1
65
       Cover: 44
       MIR: 29
66
       StrongCG: 24
67
68
       Relax-and-lift: 1
     Explored 1 nodes (12824 simplex iterations) in 17.37 seconds (32.84 work units)
70
     Thread count was 8 (of 8 available processors)
73
     Solution count 2: 743 823
74
75
     Optimal solution found (tolerance 1.00e-10)
     Best objective 7.430000000000e+02, best bound 7.43000000000e+02, gap 0.0000%
76
     Set parameter MIPGap to value 1e-08
     Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
78
```

```
80 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
 81 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
 83 Optimize a model with 3035761 rows, 2395885 columns and 21185578 nonzeros
 84 Model fingerprint: 0xd0db789e
    Variable types: 1181973 continuous, 1213912 integer (1207162 binary)
 86 Coefficient statistics:
 87
     Matrix range [1e-01, 1e+10]
     Objective range [6e-05, 5e+01]
 88
     Bounds range [1e+00, 8e+01]
 89
                    [8e-01, 1e+10]
 90
     RHS range
 91
    Warning: Model contains large matrix coefficients
    Warning: Model contains large rhs
 93
          Consider reformulating model or setting NumericFocus parameter
 94
          to avoid numerical issues.
 95 Presolve removed 3032478 rows and 2394685 columns (presolve time = 5s) ...
    Presolve removed 3033528 rows and 2395035 columns
 97 Presolve time: 6.70s
 98 Presolved: 2233 rows, 850 columns, 6060 nonzeros
    Variable types: 9 continuous, 841 integer (502 binary)
100 Found heuristic solution: objective 3482.4264926
101
102 Root simplex log...
103
104 Iteration Objective
                           Primal Inf. Dual Inf.
                                                   Time
        0 8.2899365e+03 5.941813e+03 0.000000e+00
105
       647 4.8614888e+03 0.000000e+00 0.000000e+00
106
107
108 Root relaxation: objective 4.861489e+03, 647 iterations, 0.02 seconds (0.01 work units)
109
110
       Nodes | Current Node | Objective Bounds
                                                          Work
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
111
112
       0 \quad 0.4861.48879 \quad 0 \quad 45.3482.42649.4861.48879.39.6\%
113
114 H 0 0
                        4854.6166146 4861.48879 0.14%
       0 0 4861.07693 0 7 4854.61661 4861.07693 0.13%
115
116
       0 0 4861.07693 0 8 4854.61661 4861.07693 0.13% -
117 H 0 0
                         4860.4829105 4861.07693 0.01% - 8s
                         4861.0769320 4861.07693 0.00%
118 H 0 0
119
120 Explored 1 nodes (1204 simplex iterations) in 8.79 seconds (9.77 work units)
121 Thread count was 8 (of 8 available processors)
122
123 Solution count 4: 4861.08 4860.48 4854.62 3482.43
124
125 Optimal solution found (tolerance 1.00e-08)
126 Best objective 4.861076932024e+03, best bound 4.861076933877e+03, gap 0.0000%
127 SP is solved
128 SP's optimal solution is' □4861
129
130 Itr = 0
131 Collect_LB = [743.0]
132 Collect_UB = [10465.153864048996]
133 Collect_Hua = [0.0]
134 Collect SPObjVal = [4861.076932024498]
135 Collect MPObjValNHua = [743.0]
136
137
138 Set parameter TimeLimit to value 12000
139 Set parameter MIPGap to value 0.0005
140 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
141
142 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
143 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
144
145 Optimize a model with 603390 rows, 344301 columns and 1681663 nonzeros
146 Model fingerprint: 0x6ffc1c11
147 Variable types: 1 continuous, 344300 integer (344260 binary)
148 Coefficient statistics:
     Matrix range [1e+00, 1e+10]
149
150 Objective range [1e+00, 2e+01]
     Bounds range [1e+00, 1e+00]
151
152
     RHS range
                    [1e+00, 2e+10]
153 Warning: Model contains large matrix coefficients
154 Warning: Model contains large rhs
155
          Consider reformulating model or setting NumericFocus parameter
156
          to avoid numerical issues.
157 Presolve removed 413625 rows and 321128 columns (presolve time = 5s) ...
158 Presolve removed 413625 rows and 321128 columns (presolve time = 10s) ...
159 Presolve removed 535578 rows and 333380 columns
160 Presolve time: 11.59s
161 Presolved: 67812 rows, 10921 columns, 173175 nonzeros
162 Variable types: 0 continuous, 10921 integer (10891 binary)
163
```

```
164 Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
165 Showing first log only...
166
167 Root relaxation presolved: 10921 rows, 78733 columns, 184096 nonzeros
168
169
170 Root simplex log...
171
172 Iteration Objective
                           Primal Inf. Dual Inf.
        0 5.6040769e+03 0.000000e+00 5.338000e+03
173
                                                           12s
174 Concurrent spin time: 0.03s
175
176 Solved with dual simplex (primal model)
177
178 Root relaxation: objective 5.604077e+03, 4299 iterations, 0.48 seconds (0.62 work units)
179
180
                                   Objective Bounds
       Nodes | Current Node |
                                                          Work
181
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
182
183
           0 5604.07693 0 10
                                     - 5604.07693
184
           0.5604.07693 0 75
                                     - 5604.07693
       0
                                                        - 13s
                                     - 5604.07693
185
       0
           0 5604.07693 0 68
                                                        - 14s
186
       0
           0 5604.07693 0 24
                                     - 5604.07693
187
       0
           0 5604.07693 0 35
                                     - 5604.07693
                                                        - 15s
           0 5604.07693 0 78
188
                                     - 5604.07693
       0
                                                        - 16s
189
       0
           0\ 5604.07693\quad 0\quad 75
                                     - 5604.07693
                                                        - 16s
           0 5604.07693 0 68
190
                                     - 5604.07693
       0 \quad \  \  0\ 5604.07693 \quad 0 \quad 68
191
                                     - 5604.07693
                                                        - 20s
                        5604.0769320 5604.07693 0.00% - 20s
192 H 0 0
193
       0 0 5604.07693 0 68 5604.07693 5604.07693 0.00%
194
195 Cutting planes:
196
     Learned: 2
197
      Gomory: 2
198
     Cover: 217
      Implied bound: 18
199
200
      Clique: 678
201
      MIR: 158
202
      StrongCG: 167
203
      GUB cover: 11
204
      RLT: 2
205
      Relax-and-lift: 9
206
      BOP: 2
207
208 Explored 1 nodes (29914 simplex iterations) in 20.62 seconds (28.74 work units)
209 Thread count was 8 (of 8 available processors)
210
211 Solution count 1: 5604.08
212
213 Optimal solution found (tolerance 5.00e-04)
214 Best objective 5.604076932024e+03, best bound 5.604076932024e+03, gap 0.0000%
215 Set parameter MIPGap to value 1e-08
216 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
217
218 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
219 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
220
221 Optimize a model with 3035761 rows, 2395885 columns and 21185578 nonzeros
222 Model fingerprint: 0xfa611190
223 Variable types: 1181973 continuous, 1213912 integer (1207162 binary)
224 Coefficient statistics:
225
      Matrix range [1e-01, 1e+10]
226
     Objective range [6e-05, 5e+01]
227
     Bounds range [1e+00, 8e+01]
228
                    [8e-01, 1e+10]
     RHS range
229 Warning: Model contains large matrix coefficients
230 Warning: Model contains large rhs
231
          Consider reformulating model or setting NumericFocus parameter
232
          to avoid numerical issues.
233 Presolve removed 3029879 rows and 2393977 columns (presolve time = 5s) ...
234 Presolve removed 3029927 rows and 2393995 columns
235 Presolve time: 5.76s
236 Presolved: 5834 rows, 1890 columns, 15471 nonzeros
237 Variable types: 10 continuous, 1880 integer (1090 binary)
238 Found heuristic solution: objective 4133.9680293
239
240 Root simplex log...
241
                           Primal Inf. Dual Inf.
242 Iteration Objective
        0 1.2304000e+04 5.034479e+03 0.000000e+00
243
       1816 5.9878730e+03 0.000000e+00 0.000000e+00
244
245
246 Root relaxation: objective 5.987873e+03, 1816 iterations, 0.02 seconds (0.02 work units)
247
```

```
248
       Nodes | Current Node | Objective Bounds
                                                          Work
249
    Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
250
251
        0 \quad 0 \ 5987.87302 \quad 0 \quad 89 \ 4133.96803 \ 5987.87302 \ \ 44.8\%
252 H 0 0
                         5607.1254678 5987.87302 6.79% - 7s
253 H 0 0
                         5980.5533893 5986.94444 0.11%
        0 0 5986.94444 0 54 5980.55339 5986.94444 0.11% - 7s
254
255
        0 0 5986.94444 0 40 5980.55339 5986.94444 0.11%
                                                                  7s
       0 0 5986.94444 0 26 5980.55339 5986.94444 0.11%
256
                                                                  7s
                       5986.9444444 5986.94444 0.00% - 7s
257 H 0 0
       0 0 5986.94444 0 26 5986.94444 5986.94444 0.00%
258
259
260 Cutting planes:
261
     Learned: 2
262
      Gomory: 4
263
      Cover: 2
      Implied bound: 5
264
265
      Clique: 7
266
      MIR: 4
267
      Flow cover: 1
268
      Zero half: 2
269
      RLT: 4
270
      Relax-and-lift: 1
271
272 Explored 1 nodes (3762 simplex iterations) in 7.83 seconds (8.49 work units)
273 Thread count was 8 (of 8 available processors)
275 Solution count 4: 5986.94 5980.55 5607.13 4133.97
276
277 Optimal solution found (tolerance 1.00e-08)
278 Best objective 5.98694444444e+03, best bound 5.98694444444e+03, gap 0.0000%
279 SP is solved
280 SP's optimal solution is' ☐ 5986
281
282 	ext{ Itr} = 1
283 Collect_LB = [743.0, 5604.076932024498]
284 Collect_UB = [10465.153864048996, 6729.944444444442]
285 Collect Hua = [0.0, 4861.076932024498]
286 Collect SPObjVal = [4861.076932024498, 5986.94444444442]
287 Collect_MPObjValNHua = [743.0, 743.0]
288
289
290 Set parameter TimeLimit to value 12000
291 Set parameter MIPGap to value 0.0005
292 Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
293
294 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
295
    Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
296
297 Optimize a model with 603391 rows, 344301 columns and 1681684 nonzeros
298 Model fingerprint: 0x4b281349
299 Variable types: 1 continuous, 344300 integer (344260 binary)
300 Coefficient statistics:
     Matrix range [1e+00, 1e+10]
301
302
     Objective range [1e+00, 2e+01]
303
     Bounds range [1e+00, 1e+00]
304
     RHS range
                    [1e+00, 2e+10]
305 Warning: Model contains large matrix coefficients
306
    Warning: Model contains large rhs
307
          Consider reformulating model or setting NumericFocus parameter
308
          to avoid numerical issues.
309 Presolve removed 417667 rows and 321479 columns (presolve time = 5s) ...
310 Presolve removed 417667 rows and 321479 columns (presolve time = 10s) ...
311 Presolve removed 536165 rows and 333455 columns
312 Presolve time: 11.42s
313 Presolved: 67226 rows, 10846 columns, 170827 nonzeros
314 Variable types: 0 continuous, 10846 integer (10816 binary)
315
316 Deterministic concurrent LP optimizer: primal and dual simplex (primal and dual model)
317 Showing first log only...
318
319 Root relaxation presolved: 10846 rows, 78072 columns, 181673 nonzeros
320
321
322 Root simplex log...
323
324 Iteration Objective
                           Primal Inf. Dual Inf.
325
        0 6.7324444e+03 0.000000e+00 5.338000e+03
                                                           12s
326 Concurrent spin time: 0.09s
327
328 Solved with dual simplex (primal model)
329
330 Root relaxation: objective 6.732444e+03, 4502 iterations, 0.44 seconds (0.67 work units)
331
```

```
332
       Nodes | Current Node | Objective Bounds
                                                         Work
333
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
334
335
           0 6732.44444 0 23
                                    - 6732.44444
336
       0 0 6732.44444 0 353
                                    - 6732.44444 - - 14s
337
       0
           0 6732.44444 0 296
                                     - 6732.44444
                                                       - 14s
                                                   - - 14s
338
           0 6732.44444 0 201
                                     - 6732.44444
       0
339
          0 6732.44444 0 93
                                    - 6732.44444
                                                   - - 17s
           0.6732.44444 \quad 0 \quad 101
340
       0
                                    - 6732.44444
                                                   - - 17s
                                                   - - 18s
341
           0.6732.44444 0.47
                                    - 6732.44444
       0
       0 0 6732.44444 0 101
                                    - 6732.44444
342
                                                   - - 18s
343
       0
           0 6732.44444 0 64
                                    - 6732.44444
                   6832.4444444 6732.44444 1.46% - 19s
6812.4444444 6732.44444 1.17% - 19s
6732.4444444 6732.44444 0.0004
344 H 0 0
345 H 0 0
346 H 0 0
                       6732.4444444 6732.44444 0.00% - 21s
       0 0 6732.44444 0 64 6732.44444 6732.44444 0.00% - 21s
347
348
349 Cutting planes:
350 Learned: 1
351
      Gomory: 1
352
      Cover: 89
      Implied bound: 394
353
354
      Clique: 1070
355
      MIR: 26
      StrongCG: 19
356
357
      GUB cover: 8
358
      Zero half: 2
359
      RLT: 2
360
      Relax-and-lift: 20
361
      BQP: 9
362
363 Explored 1 nodes (29232 simplex iterations) in 21.37 seconds (32.16 work units)
364 Thread count was 8 (of 8 available processors)
365
366 Solution count 3: 6732.44 6812.44 6832.44
367
368 Optimal solution found (tolerance 5.00e-04)
369 Best objective 6.73244444444e+03, best bound 6.7324444444e+03, gap 0.0000%
370 Set parameter MIPGap to value 1e-08
371
    Gurobi Optimizer version 10.0.2 build v10.0.2rc0 (win64)
372
373 CPU model: 11th Gen Intel(R) Core(TM) i7-11370H @ 3.30GHz, instruction set [SSE2|AVX|AVX2|AVX512]
374 Thread count: 4 physical cores, 8 logical processors, using up to 8 threads
375
376 Optimize a model with 3035761 rows, 2395885 columns and 21185578 nonzeros
377 Model fingerprint: 0x4b39522e
378 Variable types: 1181973 continuous, 1213912 integer (1207162 binary)
379 Coefficient statistics:
380 Matrix range [1e-01, 1e+10]
381
     Objective range [6e-05, 5e+01]
382
      Bounds range [1e+00, 8e+01]
                   [8e-01, 1e+10]
     RHS range
384 Warning: Model contains large matrix coefficients
385 Warning: Model contains large rhs
386
          Consider reformulating model or setting NumericFocus parameter
387
          to avoid numerical issues.
388 Presolve removed 3030796 rows and 2394227 columns (presolve time = 5s) ...
389 Presolve removed 3031116 rows and 2394327 columns
390
    Presolve time: 6.12s
391 Presolved: 4645 rows, 1558 columns, 12363 nonzeros
392
    Variable types: 10 continuous, 1548 integer (906 binary)
393
394 Root simplex log...
395
396 Iteration Objective
                          Primal Inf. Dual Inf.
397
         0 1.1149000e+04 5.079458e+03 0.000000e+00
398
       1283 5.8269444e+03 0.000000e+00 0.000000e+00
399
400 Root relaxation: objective 5.826944e+03, 1283 iterations, 0.01 seconds (0.01 work units)
401
402
       Nodes | Current Node | Objective Bounds
403
     Expl Unexpl | Obj Depth IntInf | Incumbent BestBd Gap | It/Node Time
404
                         5826.9444444 14682.7778 152% - 7s
405 H 0 0
406
       0 0
                  - 0 5826.94444 5826.94444 0.00% - 7s
407
408 Explored 1 nodes (1978 simplex iterations) in 8.04 seconds (8.97 work units)
409 Thread count was 8 (of 8 available processors)
410
411 Solution count 1: 5826.94
412
413 Optimal solution found (tolerance 1.00e-08)
414 Best objective 5.82694444444e+03, best bound 5.82694444444e+03, gap 0.0000%
415 SP is solved
```

```
unknown
416 SP's optimal solution is' □ 5826
417
418 Itr = 2
419 Collect_LB = [743.0, 5604.076932024498, 6732.444444444442]
420 Collect UB = [10465.153864048996, 6729.94444444442, 6572.44444444442]
421 Collect Hua = [0.0, 4861.076932024498, 5986.94444444442]
422 Collect_SPObjVal = [4861.076932024498, 5986.944444444442, 5826.94444444442]
423 Collect_MPObjValNHua = [743.0, 743.0, 745.5]
424
425
426 Ops, stop iteration
427
      Values adopted from the Itr-1' th iteration, and Itr = \{2\}, judgeCount = \{1\}
428
               ~judgeCount = 1, SPObj_SPF = 5986.94444444442
429
430 Vessel i: 0:
                   pi: 0-5,
                            ai-di: 5-15,
                                          gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                ai_SP-di: 5-15, taoi-deltai: 5-10,
                                                                                                                    taoPi_SP-deltaPi_SP: 5-10, betaNi: 5,
     bi: 5
                   pi: 0-7,
                             ai-di: 22-44,
                                                                                                                       taoPi SP-deltaPi SP: 22-34,
     Vessel i: 1:
                                            gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                 ai SP-di: 22-44,
                                                                                                   taoi-deltai: 22-34,
                                                                                                                                                   betaNi:
     12, bi: 12
                   pi: 5-10,
432 Vessel i: 2:
                              ai-di: 8-26,
                                            gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                 ai_SP-di: 8-26,
                                                                                                  taoi-deltai: 8-19,
                                                                                                                     taoPi_SP-deltaPi_SP: 8-19,
                                                                                                                                                  betaNi: 11
         bi: 11
     Vessel i: 3:
                                            gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                                                       taoPi_SP-deltaPi_SP: 41-53,
                   pi: 3-8,
                             ai-di: 41-62,
                                                                                 ai_SP-di: 41-62,
                                                                                                   taoi-deltai: 41-53,
                                                                                                                                                     betaNi:
      12,
          bi: 12
     Vessel i: 4:
                   pi: 3-10,
                                                                                                                         taoPi_SP-deltaPi_SP: 55-75,
                              ai-di: 55-82,
                                             gi_SP-gpi_SP: 0.000000-0.000000,
                                                                                  ai_SP-di: 55-82,
                                                                                                     taoi-deltai: 55-75,
                                                                                                                                                       betaNi
      : 20, bi: 20
                   pi: 17-22,
     Vessel i: 5:
                                               gi_SP-gpi_SP: 0.000000-1.000000,
                                                                                   ai_SP-di: 18-61,
                                                                                                                          taoPi_SP-deltaPi_SP: 21-46,
                                ai-di: 18-61,
                                                                                                     taoi-deltai: 21-46,
     betaNi: 25,
                   bi: 25
                                                                                                                         taoPi SP-deltaPi SP: 16-20,
     Vessel i: 6:
                   pi: 15-20,
                                ai-di: 9-39,
                                             gi_SP-gpi_SP: 0.875000-0.400000,
                                                                                  ai SP-di: 15-39,
                                                                                                     taoi-deltai: 11-20,
                                                                                                                                                       betaNi
      : 9.
          bi: 9
437
     Vessel i: 7:
                   pi: 10-16,
                                ai-di: 35-77,
                                               gi_SP-gpi_SP: 1.000000-0.600000,
                                                                                   ai_SP-di: 45-77,
                                                                                                     taoi-deltai: 40-59,
                                                                                                                          taoPi_SP-deltaPi_SP: 45-59,
     betaNi: 19,
                   bi: 19
     Vessel i: 8:
                   pi: 10-15,
                                ai-di: 5-41,
                                             gi SP-gpi SP: 0.553571-1.000000,
                                                                                  ai SP-di: 8-41,
                                                                                                   taoi-deltai: 12-25,
                                                                                                                       taoPi SP-deltaPi SP: 12-25,
                                                                                                                                                    betaNi:
     13, bi: 13
439
     Vessel i: 9:
                   pi: 10-15,
                                ai-di: 29-55,
                                              gi_SP-gpi_SP: 0.571429-0.000000,
                                                                                   ai_SP-di: 33-55,
                                                                                                     taoi-deltai: 33-39,
                                                                                                                          taoPi_SP-deltaPi_SP: 33-39,
     betaNi: 6,
                  bi: 6
440
441 round LB = [743, 5604, 6732]
442 round UB = [10465, 6730, 6572]
443 round Hua = [0, 4861, 5987]
444 round SPObjVal = [4861, 5987, 5827]
445 round MPObjValNHua = [743, 743, 746]
446
447 OptimalObj = 6732.44444444442
448 Time: 591.000000
449
450
451
452
```