

```

1 "E:\1 \0000\3 \0000\1 \0000\0000\1 \0000\0000\1_LW_\0000\4 \0000\3 python_code\1 exzample\2 \0000\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=3345
2
3 import sys; print('Python %s on %s' % (sys.version, sys.platform))
4 sys.path.extend(['E:\1 \0000\3 \0000\1 \0000\0000\1 \0000\0000\1_LW_\0000\4 \0000\3 python_code\9 Code for this
  paper', 'E:\1 \0000\3 \0000\1 \0000\0000\1 \0000\0000\1_LW_\0000\4 \0000\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 \0000\3 \0000\1 \0000\0000\1 \0000\0000\1_LW_\0000\4 \0000\3 python_code\9 Code for this paper/
  main_RO_CCG_ExtendedByMe.py', wdir='E:\1 \0000\3 \0000\1 \0000\0000\1 \0000\0000\1_LW_\0000\4 \0000\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_40_1.xlsx instance by ECCCG
14
15 Master problem status = 2 , is Optimal and MP obj = 1298.0
16 The initial lb = -inf ub = inf
17
18 The current iteration cnt = 0
19 The SP model was solved Optimal 2 and SPObj = 1298.0
20 Deterministic Sub problem Status= 2 , is Optimal
21 Master problem status = 2 , is Optimal
22 lb = 2514.0 ub = 2514.0
23 MPObj = 2514.0 MP_delete_Hua_Obj = 1326.0 Hua = 1188.0 SPObj = 1298.0 Deter_SP_Obj = 1188.0
24
25 ub - lb = 0.0
26
27 Iteration cycle stopped by termination criterion 1: Because ub - lb <= eps, the iteration stop, and cnt = 0
28 i: 0.0 l_i: 3.0 p_i: 11.0 al_i: 3.0 sol_a_i: 3.0 sol_g_i: 0.0 d_i: 15.0 sol_taoi: 3.0 sol_deltai: 12.0 sol_deltai - sol_taoi: 9.0 sol_taoP: 3
  .0 sol_deltaP: 8.0 sol_deltaP - sol_taoP: 5.0 cl_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2372796.0 wasted work: 0.0
29 i: 1.0 l_i: 5.0 p_i: 12.0 al_i: 24.0 sol_a_i: 24.0 sol_g_i: 0.0 d_i: 34.0 sol_taoi: 24.0 sol_deltai: 31.0 sol_deltai - sol_taoi: 7.0 sol_taoP
  : 25.0 sol_deltaP: 27.0 sol_deltaP - sol_taoP: 2.0 cl_i: 1845508.0 sol_c_i: 1845508.0 sol_gp_i: 0.0 total work: 1845508.0 wasted work: 0.0
30 i: 2.0 l_i: 3.0 p_i: 8.0 al_i: 5.0 sol_a_i: 5.0 sol_g_i: 0.0 d_i: 17.0 sol_taoi: 5.0 sol_deltai: 14.0 sol_deltai - sol_taoi: 9.0 sol_taoP: 5.0
  sol_deltaP: 9.0 sol_deltaP - sol_taoP: 4.0 cl_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2504618.0 wasted work: 0.5
31 i: 3.0 l_i: 3.0 p_i: 0.0 al_i: 29.0 sol_a_i: 29.0 sol_g_i: 0.0 d_i: 34.0 sol_taoi: 29.0 sol_deltai: 33.0 sol_deltai - sol_taoi: 4.0 sol_taoP:
  29.0 sol_deltaP: 31.0 sol_deltaP - sol_taoP: 2.0 cl_i: 1054576.0 sol_c_i: 1054576.0 sol_gp_i: 0.0 total work: 1054576.0 wasted work: 0.0
32 i: 4.0 l_i: 3.0 p_i: 0.0 al_i: 60.0 sol_a_i: 60.0 sol_g_i: 0.0 d_i: 64.0 sol_taoi: 60.0 sol_deltai: 62.0 sol_deltai - sol_taoi: 2.0 sol_taoP:
  61.0 sol_deltaP: 62.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 527288.0 wasted work: 0.0
33 i: 5.0 l_i: 4.0 p_i: 14.0 al_i: 1.0 sol_a_i: 1.0 sol_g_i: 0.0 d_i: 11.0 sol_taoi: 1.0 sol_deltai: 10.0 sol_deltai - sol_taoi: 9.0 sol_taoP: 1
  .0 sol_deltaP: 3.0 sol_deltaP - sol_taoP: 2.0 cl_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2636440.0 wasted work: 1.0
34 i: 6.0 l_i: 3.0 p_i: 22.0 al_i: 49.0 sol_a_i: 49.0 sol_g_i: 0.0 d_i: 55.0 sol_taoi: 49.0 sol_deltai: 55.0 sol_deltai - sol_taoi: 6.0 sol_taoP
  : 49.0 sol_deltaP: 52.0 sol_deltaP - sol_taoP: 3.0 cl_i: 1581864.0 sol_c_i: 1581864.0 sol_gp_i: 0.0 total work: 1581864.0 wasted work: 0.0
35 i: 7.0 l_i: 5.0 p_i: 29.0 al_i: 6.0 sol_a_i: 6.0 sol_g_i: 0.0 d_i: 18.0 sol_taoi: 6.0 sol_deltai: 15.0 sol_deltai - sol_taoi: 9.0 sol_taoP: 6
  .0 sol_deltaP: 8.0 sol_deltaP - sol_taoP: 2.0 cl_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2504618.0 wasted work: 0.5
36 i: 8.0 l_i: 6.0 p_i: 0.0 al_i: 24.0 sol_a_i: 24.0 sol_g_i: 0.0 d_i: 29.0 sol_taoi: 24.0 sol_deltai: 27.0 sol_deltai - sol_taoi: 3.0 sol_taoP:
  24.0 sol_deltaP: 25.0 sol_deltaP - sol_taoP: 1.0 cl_i: 790932.0 sol_c_i: 790932.0 sol_gp_i: 0.0 total work: 790932.0 wasted work: 0.0
37 i: 9.0 l_i: 3.0 p_i: 24.0 al_i: 6.0 sol_a_i: 6.0 sol_g_i: 0.0 d_i: 11.0 sol_taoi: 6.0 sol_deltai: 8.0 sol_deltai - sol_taoi: 2.0 sol_taoP: 6
  .0 sol_deltaP: 7.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 659110.0 wasted work: 0.5
38 i: 10.0 l_i: 4.0 p_i: 20.0 al_i: 4.0 sol_a_i: 4.0 sol_g_i: 0.0 d_i: 14.0 sol_taoi: 4.0 sol_deltai: 13.0 sol_deltai - sol_taoi: 9.0 sol_taoP
  : 4.0 sol_deltaP: 6.0 sol_deltaP - sol_taoP: 2.0 cl_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2636440.0 wasted work: 1.0
39 i: 11.0 l_i: 6.0 p_i: 10.0 al_i: 37.0 sol_a_i: 37.0 sol_g_i: 0.0 d_i: 44.0 sol_taoi: 37.0 sol_deltai: 46.0 sol_deltai - sol_taoi: 9.0
  sol_taoP: 37.0 sol_deltaP: 39.0 sol_deltaP - sol_taoP: 2.0 cl_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2372796.0 wasted work
  : 0.0
40 i: 12.0 l_i: 5.0 p_i: 17.0 al_i: 27.0 sol_a_i: 27.0 sol_g_i: 0.0 d_i: 32.0 sol_taoi: 27.0 sol_deltai: 29.0 sol_deltai - sol_taoi: 2.0
  sol_taoP: 27.0 sol_deltaP: 28.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 527288.0 wasted work: 0.0
41 i: 13.0 l_i: 6.0 p_i: 0.0 al_i: 41.0 sol_a_i: 41.0 sol_g_i: 0.0 d_i: 52.0 sol_taoi: 41.0 sol_deltai: 49.0 sol_deltai - sol_taoi: 8.0 sol_taoP
  : 41.0 sol_deltaP: 43.0 sol_deltaP - sol_taoP: 2.0 cl_i: 2109152.0 sol_c_i: 2109152.0 sol_gp_i: 0.0 total work: 2240974.0 wasted work: 0.5
42 i: 14.0 l_i: 3.0 p_i: 17.0 al_i: 12.0 sol_a_i: 12.0 sol_g_i: 0.0 d_i: 21.0 sol_taoi: 12.0 sol_deltai: 21.0 sol_deltai - sol_taoi: 9.0
  sol_taoP: 12.0 sol_deltaP: 15.0 sol_deltaP - sol_taoP: 3.0 cl_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2636440.0 wasted work
  : 1.0
43 i: 15.0 l_i: 3.0 p_i: 31.0 al_i: 23.0 sol_a_i: 23.0 sol_g_i: 0.0 d_i: 31.0 sol_taoi: 23.0 sol_deltai: 29.0 sol_deltai - sol_taoi: 6.0
  sol_taoP: 23.0 sol_deltaP: 26.0 sol_deltaP - sol_taoP: 3.0 cl_i: 1581864.0 sol_c_i: 1581864.0 sol_gp_i: 0.0 total work: 1581864.0 wasted work
  : 0.0
44 i: 16.0 l_i: 4.0 p_i: 6.0 al_i: 34.0 sol_a_i: 34.0 sol_g_i: 0.0 d_i: 40.0 sol_taoi: 34.0 sol_deltai: 41.0 sol_deltai - sol_taoi: 7.0 sol_taoP
  : 34.0 sol_deltaP: 36.0 sol_deltaP - sol_taoP: 2.0 cl_i: 1845508.0 sol_c_i: 1845508.0 sol_gp_i: 0.0 total work: 1845508.0 wasted work: 0.0
45 i: 17.0 l_i: 3.0 p_i: 6.0 al_i: 30.0 sol_a_i: 30.0 sol_g_i: 0.0 d_i: 36.0 sol_taoi: 30.0 sol_deltai: 32.0 sol_deltai - sol_taoi: 2.0 sol_taoP
  : 30.0 sol_deltaP: 31.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 790932.0 wasted work: 1.0
46 i: 18.0 l_i: 3.0 p_i: 25.0 al_i: 50.0 sol_a_i: 50.0 sol_g_i: 0.0 d_i: 53.0 sol_taoi: 50.0 sol_deltai: 55.0 sol_deltai - sol_taoi: 5.0
  sol_taoP: 50.0 sol_deltaP: 52.0 sol_deltaP - sol_taoP: 2.0 cl_i: 1318220.0 sol_c_i: 1318220.0 sol_gp_i: 0.0 total work: 1318220.0 wasted work
  : 0.0
47 i: 19.0 l_i: 3.0 p_i: 3.0 al_i: 30.0 sol_a_i: 30.0 sol_g_i: 0.0 d_i: 36.0 sol_taoi: 30.0 sol_deltai: 32.0 sol_deltai - sol_taoi: 2.0 sol_taoP
  : 30.0 sol_deltaP: 31.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 527288.0 wasted work: 0.0
48 i: 20.0 l_i: 3.0 p_i: 17.0 al_i: 30.0 sol_a_i: 30.0 sol_g_i: 0.0 d_i: 34.0 sol_taoi: 30.0 sol_deltai: 34.0 sol_deltai - sol_taoi: 4.0
  sol_taoP: 30.0 sol_deltaP: 32.0 sol_deltaP - sol_taoP: 2.0 cl_i: 1054576.0 sol_c_i: 1054576.0 sol_gp_i: 0.0 total work: 1054576.0 wasted work
  : 0.0
49 i: 21.0 l_i: 5.0 p_i: 24.0 al_i: 10.0 sol_a_i: 10.0 sol_g_i: 0.0 d_i: 15.0 sol_taoi: 10.0 sol_deltai: 12.0 sol_deltai - sol_taoi: 2.0
  sol_taoP: 10.0 sol_deltaP: 11.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 527288.0 wasted work: 0.0
50 i: 22.0 l_i: 3.0 p_i: 9.0 al_i: 19.0 sol_a_i: 19.0 sol_g_i: 0.0 d_i: 28.0 sol_taoi: 19.0 sol_deltai: 27.0 sol_deltai - sol_taoi: 8.0 sol_taoP
  : 19.0 sol_deltaP: 22.0 sol_deltaP - sol_taoP: 3.0 cl_i: 2109152.0 sol_c_i: 2109152.0 sol_gp_i: 0.0 total work: 2504618.0 wasted work: 1.5
51 i: 23.0 l_i: 3.0 p_i: 0.0 al_i: 19.0 sol_a_i: 19.0 sol_g_i: 0.0 d_i: 22.0 sol_taoi: 19.0 sol_deltai: 23.0 sol_deltai - sol_taoi: 4.0 sol_taoP

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51 : 19.0 sol_deltaP: 21.0 sol_deltaP - sol_taoP: 2.0 cl_i: 1054576.0 sol_c_i: 1054576.0 sol_gp_i: 0.0 total work: 1054576.0 wasted work: 0.0
52 i: 24.0 l_i: 3.0 p_i: 0.0 al_i: 63.0 sol_a_i: 63.0 sol_g_i: 0.0 d_i: 68.0 sol_taoi: 63.0 sol_deltai: 69.0 sol_deltai - sol_taoi: 6.0
sol_taoP: 63.0 sol_deltaP: 66.0 sol_deltaP - sol_taoP: 3.0 cl_i: 1581864.0 sol_c_i: 1581864.0 sol_gp_i: 0.0 total work: 1581864.0 wasted work
: 0.0
53 i: 25.0 l_i: 5.0 p_i: 6.0 al_i: 15.0 sol_a_i: 15.0 sol_g_i: 0.0 d_i: 20.0 sol_taoi: 15.0 sol_deltai: 17.0 sol_deltai - sol_taoi: 2.0
sol_taoP: 15.0 sol_deltaP: 16.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 527288.0 wasted work: 0.0
54 i: 26.0 l_i: 3.0 p_i: 16.0 al_i: 43.0 sol_a_i: 43.0 sol_g_i: 0.0 d_i: 47.0 sol_taoi: 43.0 sol_deltai: 45.0 sol_deltai - sol_taoi: 2.0
sol_taoP: 43.0 sol_deltaP: 44.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 527288.0 wasted work: 0.0
55 i: 27.0 l_i: 5.0 p_i: 0.0 al_i: 1.0 sol_a_i: 1.0 sol_g_i: 0.0 d_i: 4.0 sol_taoi: 1.0 sol_deltai: 3.0 sol_deltai - sol_taoi: 2.0 sol_taoP: 1.
0 sol_deltaP: 2.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 527288.0 sol_gp_i: 0.0 total work: 527288.0 wasted work: 0.0
56 i: 28.0 l_i: 4.0 p_i: 6.0 al_i: 45.0 sol_a_i: 45.0 sol_g_i: 0.0 d_i: 51.0 sol_taoi: 45.0 sol_deltai: 50.0 sol_deltai - sol_taoi: 5.0
sol_taoP: 45.0 sol_deltaP: 46.0 sol_deltaP - sol_taoP: 1.0 cl_i: 1318220.0 sol_c_i: 1318220.0 sol_gp_i: 0.0 total work: 1318220.0 wasted work
: 0.0
57 i: 29.0 l_i: 4.0 p_i: 18.0 al_i: 60.0 sol_a_i: 60.0 sol_g_i: 0.0 d_i: 66.0 sol_taoi: 60.0 sol_deltai: 63.0 sol_deltai - sol_taoi: 3.0
sol_taoP: 60.0 sol_deltaP: 61.0 sol_deltaP - sol_taoP: 1.0 cl_i: 790932.0 sol_c_i: 790932.0 sol_gp_i: 0.0 total work: 922754.0 wasted work: 0.5
58 i: 30.0 l_i: 4.0 p_i: 28.0 al_i: 46.0 sol_a_i: 46.0 sol_g_i: 0.0 d_i: 49.0 sol_taoi: 46.0 sol_deltai: 50.0 sol_deltai - sol_taoi: 4.0
sol_taoP: 46.0 sol_deltaP: 47.0 sol_deltaP - sol_taoP: 1.0 cl_i: 1054576.0 sol_c_i: 1054576.0 sol_gp_i: 0.0 total work: 1318220.0 wasted work
: 1.0
59 i: 31.0 l_i: 5.0 p_i: 18.0 al_i: 0.0 sol_a_i: 0.0 sol_g_i: 0.0 d_i: 4.0 sol_taoi: 0.0 sol_deltai: 3.0 sol_deltai - sol_taoi: 3.0 sol_taoP:
0.0 sol_deltaP: 1.0 sol_deltaP - sol_taoP: 1.0 cl_i: 790932.0 sol_c_i: 790932.0 sol_gp_i: 0.0 total work: 1581864.0 wasted work: 3.0
60 i: 32.0 l_i: 5.0 p_i: 22.0 al_i: 24.0 sol_a_i: 24.0 sol_g_i: 0.0 d_i: 35.0 sol_taoi: 24.0 sol_deltai: 33.0 sol_deltai - sol_taoi: 9.0
sol_taoP: 24.0 sol_deltaP: 26.0 sol_deltaP - sol_taoP: 2.0 cl_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2372796.0 wasted work
: 0.0
61 i: 33.0 l_i: 4.0 p_i: 0.0 al_i: 6.0 sol_a_i: 10.0 sol_g_i: 0.8 d_i: 14.0 sol_taoi: 10.0 sol_deltai: 17.0 sol_deltai - sol_taoi: 7.0
sol_taoP: 10.0 sol_deltaP: 13.0 sol_deltaP - sol_taoP: 3.0 cl_i: 1845508.0 sol_c_i: 1977330.0 sol_gp_i: 0.08333333333333333 total work:
1977330.0 wasted work: 0.0
62 i: 34.0 l_i: 3.0 p_i: 6.0 al_i: 26.0 sol_a_i: 27.0 sol_g_i: 0.125 d_i: 35.0 sol_taoi: 27.0 sol_deltai: 29.0 sol_deltai - sol_taoi: 2.0
sol_taoP: 27.0 sol_deltaP: 28.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 712466.5238095238 sol_gp_i: 0.17559523809523808 total work
: 790932.0 wasted work: 0.2976190476190477
63 i: 35.0 l_i: 4.0 p_i: 4.0 al_i: 8.0 sol_a_i: 9.0 sol_g_i: 0.1 d_i: 13.0 sol_taoi: 9.0 sol_deltai: 11.0 sol_deltai - sol_taoi: 2.0 sol_taoP:
9.0 sol_deltaP: 10.0 sol_deltaP - sol_taoP: 1.0 cl_i: 527288.0 sol_c_i: 922754.0 sol_gp_i: 0.375 total work: 922754.0 wasted work: 0.0
64 i: 36.0 l_i: 5.0 p_i: 3.0 al_i: 53.0 sol_a_i: 58.0 sol_g_i: 0.7142857142857143 d_i: 61.0 sol_taoi: 58.0 sol_deltai: 67.0 sol_deltai -
sol_taoi: 9.0 sol_taoP: 58.0 sol_deltaP: 61.0 sol_deltaP - sol_taoP: 3.0 cl_i: 2372796.0 sol_c_i: 4086482.0 sol_gp_i: 0.9285714285714286
total work: 4218304.0 wasted work: 0.5
65 i: 37.0 l_i: 4.0 p_i: 27.0 al_i: 17.0 sol_a_i: 22.0 sol_g_i: 0.7142857142857143 d_i: 23.0 sol_taoi: 22.0 sol_deltai: 29.0 sol_deltai -
sol_taoi: 7.0 sol_taoP: 22.0 sol_deltaP: 24.0 sol_deltaP - sol_taoP: 2.0 cl_i: 1845508.0 sol_c_i: 2372796.0 sol_gp_i: 1.0 total work: 2372796.0
wasted work: 0.0
66 i: 38.0 l_i: 6.0 p_i: 22.0 al_i: 55.0 sol_a_i: 59.61190476190476 sol_g_i: 0.7686507936507916 d_i: 63.0 sol_taoi: 60.0 sol_deltai: 68.
0 sol_deltai - sol_taoi: 8.0 sol_taoP: 61.0 sol_deltaP: 63.0 sol_deltaP - sol_taoP: 2.0 cl_i: 2109152.0 sol_c_i: 3427372.0 sol_gp_i: 1.0 total
work: 3427372.0 wasted work: 0.0
67 i: 39.0 l_i: 6.0 p_i: 28.0 al_i: 46.0 sol_a_i: 53.0 sol_g_i: 0.7777777777777778 d_i: 54.0 sol_taoi: 53.0 sol_deltai: 62.0 sol_deltai -
sol_taoi: 9.0 sol_taoP: 53.0 sol_deltaP: 55.0 sol_deltaP - sol_taoP: 2.0 cl_i: 2372796.0 sol_c_i: 3295550.0 sol_gp_i: 0.4375 total work:
3427372.0 wasted work: 0.5
68 Time: 759.000000
69
70
71
72