```
"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=10169

import sys; print('Python %s on %s' % (sys.version, sys.platform))
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'])

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
>>> runfile('E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper/main_RO_CCG_ExtendedByMe.py', wdir='E:/1 □□□□/3 □□□□□/1 □□□□□□□/1 □□□□□□□□□/1_□□□□□□_□□□□/1_LW _□□□□/4 □□□□/3 python_code/9 Code for this paper')
Backend TkAgg is interactive backend. Turning interactive mode on.
Waiting 5s.....

Optimize the  ./R_40_1.xlsx  instance by ECCG

      Master protblem status =  2 , is Optimal and MP obj =  1298.0
The initial lb =  -inf       ub =  inf

The current iteration cnt =  0
      The SP model was solved Optimal 2 and SPObj =  1298.0
      Deterministic Sub problem Status=  2 , is Optimal
      Master protblem status =  2 , is Optimal
      lb =  2499.0                  ub =  2499.0
       MPObj =  2499.0       MP_delete_Hua_Obj =  1319.0      Hua =  1180.0        SPObj =  1298.0        Deter_SP_Obj =  1180.0

ub - lb =  0.0

Iteration cycle stopped by termination criterion 1: Because ub - lb <= eps, the iteration stop, and cnt =  0
    i: 0.0  l_i: 3.0  p_i: 9.0  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: 7.0   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
    i: 1.0  l_i: 5.0  p_i: 6.0  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: 24.0    sol_deltaP: 26.0    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
    i: 2.0  l_i: 3.0  p_i: 6.0  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: 10.0    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
    i: 3.0  l_i: 3.0  p_i: 11.0  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
    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: 60.0    sol_deltaP: 61.0    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
    i: 5.0  l_i: 4.0  p_i: 12.0  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: 2504618.0   wasted work: 0.5
    i: 6.0  l_i: 3.0  p_i: -0.0  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
    i: 7.0  l_i: 5.0  p_i: 20.0  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
    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
    i: 9.0  l_i: 3.0  p_i: 16.0  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
    i: 10.0  l_i: 4.0  p_i: 25.0  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
    i: 11.0  l_i: 6.0  p_i: -0.0  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: 3691016.0   wasted work: 5.0
    i: 12.0  l_i: 5.0  p_i: 18.0  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
    i: 13.0  l_i: 6.0  p_i: 6.0  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: 2372796.0   wasted work: 1.0
    i: 14.0  l_i: 3.0  p_i: 15.0  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: 2768262.0   wasted work: 1.5
    i: 15.0  l_i: 3.0  p_i: 23.0  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: 25.0    sol_deltaP - sol_taoP: 2.0  cl_i: 1581864.0    sol_c_i: 1581864.0   sol_gp_i: 0.0  total work: 1713686.0   wasted work: 0.5
    i: 16.0  l_i: 4.0  p_i: 12.0  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
    i: 17.0  l_i: 3.0  p_i: 17.0  al_i: 30.0      sol_a_i: 30.0  sol_g_i: 0.0   d_i: 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
    i: 18.0  l_i: 3.0  p_i: 3.0  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
    i: 19.0  l_i: 3.0  p_i: 14.0  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
    i: 20.0  l_i: 3.0  p_i: 23.0  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: 1450042.0   wasted work: 1.5
    i: 21.0  l_i: 5.0  p_i: 29.0  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
    i: 22.0  l_i: 3.0  p_i: 31.0  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: 2372796.0   wasted work: 1.0
```

```
i: 23.0  l_i: 3.0  p_i: 26.0  aI_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: 19.0  sol_deltaP: 21.0  sol_deltaP - sol_taoP: 2.0  cI_i: 1054576.0  sol_c_i: 1054576.0  sol_gp_i: 0.0  total work: 1054576.0  wasted work: 0.0
i: 24.0  l_i: 3.0  p_i: -0.0  aI_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  cI_i: 1581864.0  sol_c_i: 1581864.0  sol_gp_i: 0.0  total work: 1581864.0  wasted work: 0.0
i: 25.0  l_i: 5.0  p_i: 25.0  aI_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  cI_i: 527288.0  sol_c_i: 527288.0  sol_gp_i: 0.0  total work: 527288.0  wasted work: 0.0
i: 26.0  l_i: 3.0  p_i: 12.0  aI_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  cI_i: 527288.0  sol_c_i: 527288.0  sol_gp_i: 0.0  total work: 527288.0  wasted work: 0.0
i: 27.0  l_i: 5.0  p_i: -0.0  aI_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  cI_i: 527288.0  sol_c_i: 527288.0  sol_gp_i: 0.0  total work: 527288.0  wasted work: 0.0
i: 28.0  l_i: 4.0  p_i: 15.0  aI_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  cI_i: 1318220.0  sol_c_i: 1318220.0  sol_gp_i: 0.0  total work: 1318220.0  wasted work: 0.0
i: 29.0  l_i: 4.0  p_i: 19.0  aI_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  cI_i: 790932.0  sol_c_i: 790932.0  sol_gp_i: 0.0  total work: 790932.0  wasted work: 0.0
i: 30.0  l_i: 4.0  p_i: 19.0  aI_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  cI_i: 1054576.0  sol_c_i: 1054576.0  sol_gp_i: 0.0  total work: 1186398.0  wasted work: 0.5
i: 31.0  l_i: 5.0  p_i: 16.0  aI_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  cI_i: 790932.0  sol_c_i: 790932.0  sol_gp_i: 0.0  total work: 1581864.0  wasted work: 3.0
i: 32.0  l_i: 5.0  p_i: 26.0  aI_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: 25.0  sol_deltaP: 27.0  sol_deltaP - sol_taoP: 2.0  cI_i: 2372796.0  sol_c_i: 2372796.0  sol_gp_i: 0.0  total work: 2504618.0  wasted work: 0.5
i: 33.0  l_i: 4.0  p_i: -0.0  aI_i: 6.0  sol_a_i: 7.732142857142818  sol_g_i: 0.34642857142856354  d_i: 14.0  sol_taoi: 8.0  sol_deltai: 15.0  sol_deltai - sol_taoi: 7.0  sol_taoP: 8.0  sol_deltaP: 11.0  sol_deltaP - sol_taoP: 3.0  cI_i: 1845508.0  sol_c_i: 1977330.0  sol_gp_i: 0.08333333333333333  total work: 2109152.0  wasted work: 0.5
i: 34.0  l_i: 3.0  p_i: 15.0  aI_i: 26.0  sol_a_i: 27.0  sol_g_i: 0.1250000000000018  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  cI_i: 527288.0  sol_c_i: 790932.0  sol_gp_i: 0.25  total work: 790932.0  wasted work: 0.0
i: 35.0  l_i: 4.0  p_i: 16.0  aI_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  cI_i: 527288.0  sol_c_i: 527288.0  sol_gp_i: 0.0  total work: 527288.0  wasted work: 0.0
i: 36.0  l_i: 5.0  p_i: 23.0  aI_i: 53.0  sol_a_i: 56.0  sol_g_i: 0.42857142857142855  d_i: 61.0  sol_taoi: 56.0  sol_deltai: 65.0  sol_deltai - sol_taoi: 9.0  sol_taoP: 56.0  sol_deltaP: 59.0  sol_deltaP - sol_taoP: 3.0  cI_i: 2372796.0  sol_c_i: 3879960.8666666667  sol_gp_i: 0.8166666666666667  total work: 4218304.0  wasted work: 1.2833333333333332
i: 37.0  l_i: 4.0  p_i: 11.0  aI_i: 17.0  sol_a_i: 21.0  sol_g_i: 0.5714285714285714  d_i: 23.0  sol_taoi: 21.0  sol_deltai: 28.0  sol_deltai - sol_taoi: 7.0  sol_taoP: 21.0  sol_deltaP: 23.0  sol_deltaP - sol_taoP: 2.0  cI_i: 1845508.0  sol_c_i: 1977330.0  sol_gp_i: 0.25  total work: 1977330.0  wasted work: 0.0
i: 38.0  l_i: 6.0  p_i: 28.0  aI_i: 55.0  sol_a_i: 61.0  sol_g_i: 1.0  d_i: 63.0  sol_taoi: 61.0  sol_deltai: 69.0  sol_deltai - sol_taoi: 8.0  sol_taoP: 61.0  sol_deltaP: 63.0  sol_deltaP - sol_taoP: 2.0  cI_i: 2109152.0  sol_c_i: 2900084.0  sol_gp_i: 0.6  total work: 3163728.0  wasted work: 1.0
i: 39.0  l_i: 6.0  p_i: 28.0  aI_i: 46.0  sol_a_i: 49.857142857142854  sol_g_i: 0.42857142857142855  d_i: 54.0  sol_taoi: 50.0  sol_deltai: 59.0  sol_deltai - sol_taoi: 9.0  sol_taoP: 50.0  sol_deltaP: 54.0  sol_deltaP - sol_taoP: 4.0  cI_i: 2372796.0  sol_c_i: 4481948.0  sol_gp_i: 1.0  total work: 5009236.0  wasted work: 2.0
Time: 520.000000
```