```
"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=25109

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_□□□□□□_□□□□/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_30_1.xlsx  instance by ECCG

        Master protblem status =  2 , is Optimal and MP obj =  852.0
The initial lb =  -inf        ub =  inf

The current iteration cnt =  0
        The SP model was solved Optimal 2 and SPObj =  852.0
        Deterministic Sub problem Status=  2 , is Optimal
        Master protblem status =  2 , is Optimal
        lb =  1627.0                    ub =  1627.0
         MPObj =  1627.0        MP_delete_Hua_Obj =  876.0        Hua =  751.0        SPObj =  852.0        Deter_SP_Obj =  751.0

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: 4.0  p_i: 11.0  al_i: 16.0  sol_a_i: 16.0  sol_g_i: 0.0  d_i: 23.0  sol_taoi: 16.0  sol_deltai: 22.0  sol_deltai - sol_taoi: 6.0  sol_taoP: 16.0  sol_deltaP: 18.0  sol_deltaP - sol_taoP: 2.0  cl_i: 1581864.0  sol_c_i: 1581864.0  sol_gp_i: 0.0  total work: 1581864.0  wasted work: 0.0
    i: 1.0  l_i: 4.0  p_i: 21.0  al_i: 10.0  sol_a_i: 10.0  sol_g_i: 0.0  d_i: 20.0  sol_taoi: 10.0  sol_deltai: 19.0  sol_deltai - sol_taoi: 9.0  sol_taoP: 10.0  sol_deltaP: 12.0  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: 2.0  l_i: 4.0  p_i: 25.0  al_i: 13.0  sol_a_i: 13.0  sol_g_i: 0.0  d_i: 18.0  sol_taoi: 13.0  sol_deltai: 18.0  sol_deltai - sol_taoi: 5.0  sol_taoP: 13.0  sol_deltaP: 14.0  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
    i: 3.0  l_i: 5.0  p_i: 4.0  al_i: 5.0  sol_a_i: 5.0  sol_g_i: 0.0  d_i: 14.0  sol_taoi: 5.0  sol_deltai: 12.0  sol_deltai - sol_taoi: 7.0  sol_taoP: 5.0  sol_deltaP: 8.0  sol_deltaP - sol_taoP: 3.0  cl_i: 1845508.0  sol_c_i: 1845508.0  sol_gp_i: 0.0  total work: 2636440.0  wasted work: 3.0
    i: 4.0  l_i: 5.0  p_i: 6.0  al_i: 21.0  sol_a_i: 21.0  sol_g_i: 0.0  d_i: 24.0  sol_taoi: 21.0  sol_deltai: 25.0  sol_deltai - sol_taoi: 4.0  sol_taoP: 21.0  sol_deltaP: 22.0  sol_deltaP - sol_taoP: 1.0  cl_i: 1054576.0  sol_c_i: 1054576.0  sol_gp_i: 0.0  total work: 1054576.0  wasted work: 0.0
    i: 5.0  l_i: 6.0  p_i: 6.0  al_i: 25.0  sol_a_i: 25.0  sol_g_i: 0.0  d_i: 32.0  sol_taoi: 26.0  sol_deltai: 35.0  sol_deltai - sol_taoi: 9.0  sol_taoP: 26.0  sol_deltaP: 28.0  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: 4.0  p_i: 0.0  al_i: 4.0  sol_a_i: 4.0  sol_g_i: 0.0  d_i: 7.0  sol_taoi: 4.0  sol_deltai: 9.0  sol_deltai - sol_taoi: 5.0  sol_taoP: 4.0  sol_deltaP: 6.0  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: 7.0  l_i: 5.0  p_i: 24.0  al_i: 21.0  sol_a_i: 21.0  sol_g_i: 0.0  d_i: 29.0  sol_taoi: 21.0  sol_deltai: 29.0  sol_deltai - sol_taoi: 8.0  sol_taoP: 21.0  sol_deltaP: 23.0  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
    i: 8.0  l_i: 4.0  p_i: 0.0  al_i: 62.0  sol_a_i: 62.0  sol_g_i: 0.0  d_i: 67.0  sol_taoi: 62.0  sol_deltai: 66.0  sol_deltai - sol_taoi: 4.0  sol_taoP: 62.0  sol_deltaP: 64.0  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: 9.0  l_i: 5.0  p_i: 9.0  al_i: 7.0  sol_a_i: 7.0  sol_g_i: 0.0  d_i: 14.0  sol_taoi: 7.0  sol_deltai: 12.0  sol_deltai - sol_taoi: 5.0  sol_taoP: 7.0  sol_deltaP: 8.0  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
    i: 10.0  l_i: 4.0  p_i: 0.0  al_i: 27.0  sol_a_i: 27.0  sol_g_i: 0.0  d_i: 38.0  sol_taoi: 29.0  sol_deltai: 38.0  sol_deltai - sol_taoi: 9.0  sol_taoP: 29.0  sol_deltaP: 32.0  sol_deltaP - sol_taoP: 3.0  cl_i: 2372796.0  sol_c_i: 2372796.0  sol_gp_i: 0.0  total work: 2372796.0  wasted work: 0.0
    i: 11.0  l_i: 4.0  p_i: 25.0  al_i: 3.0  sol_a_i: 3.0  sol_g_i: 0.0  d_i: 9.0  sol_taoi: 3.0  sol_deltai: 7.0  sol_deltai - sol_taoi: 4.0  sol_taoP: 3.0  sol_deltaP: 4.0  sol_deltaP - sol_taoP: 1.0  cl_i: 1054576.0  sol_c_i: 1054576.0  sol_gp_i: 0.0  total work: 1054576.0  wasted work: 0.0
    i: 12.0  l_i: 5.0  p_i: 29.0  al_i: 28.0  sol_a_i: 28.0  sol_g_i: 0.0  d_i: 34.0  sol_taoi: 28.0  sol_deltai: 33.0  sol_deltai - sol_taoi: 5.0  sol_taoP: 32.0  sol_deltaP: 33.0  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
    i: 13.0  l_i: 6.0  p_i: 18.0  al_i: 31.0  sol_a_i: 31.0  sol_g_i: 0.0  d_i: 38.0  sol_taoi: 31.0  sol_deltai: 37.0  sol_deltai - sol_taoi: 6.0  sol_taoP: 33.0  sol_deltaP: 35.0  sol_deltaP - sol_taoP: 2.0  cl_i: 1581864.0  sol_c_i: 1581864.0  sol_gp_i: 0.0  total work: 2240974.0  wasted work: 2.5
    i: 14.0  l_i: 4.0  p_i: 17.0  al_i: 10.0  sol_a_i: 10.0  sol_g_i: 0.0  d_i: 18.0  sol_taoi: 10.0  sol_deltai: 16.0  sol_deltai - sol_taoi: 6.0  sol_taoP: 10.0  sol_deltaP: 12.0  sol_deltaP - sol_taoP: 2.0  cl_i: 1581864.0  sol_c_i: 1581864.0  sol_gp_i: 0.0  total work: 1581864.0  wasted work: 0.0
    i: 15.0  l_i: 6.0  p_i: 4.0  al_i: 39.0  sol_a_i: 39.0  sol_g_i: 0.0  d_i: 45.0  sol_taoi: 39.0  sol_deltai: 47.0  sol_deltai - sol_taoi: 8.0  sol_taoP: 39.0  sol_deltaP: 41.0  sol_deltaP - sol_taoP: 2.0  cl_i: 2109152.0  sol_c_i: 2109152.0  sol_gp_i: 0.0  total work: 2109152.0  wasted work: 0.0
    i: 16.0  l_i: 4.0  p_i: 25.0  al_i: 8.0  sol_a_i: 8.0  sol_g_i: 0.0  d_i: 14.0  sol_taoi: 8.0  sol_deltai: 12.0  sol_deltai - sol_taoi: 4.0  sol_taoP: 8.0  sol_deltaP: 9.0  sol_deltaP - sol_taoP: 1.0  cl_i: 1054576.0  sol_c_i: 1054576.0  sol_gp_i: 0.0  total work: 1054576.0  wasted work: 0.0
    i: 17.0  l_i: 5.0  p_i: 0.0  al_i: 52.0  sol_a_i: 52.0  sol_g_i: 0.0  d_i: 61.0  sol_taoi: 52.0  sol_deltai: 61.0  sol_deltai - sol_taoi: 9.0  sol_taoP: 52.0  sol_deltaP: 55.0  sol_deltaP - sol_taoP: 3.0  cl_i: 2372796.0  sol_c_i: 2372796.0  sol_gp_i: 0.0  total work: 2372796.0  wasted work: 0.0
    i: 18.0  l_i: 6.0  p_i: 18.0  al_i: 21.0  sol_a_i: 21.0  sol_g_i: 0.0  d_i: 28.0  sol_taoi: 21.0  sol_deltai: 30.0  sol_deltai - sol_taoi: 9.0  sol_taoP: 21.0  sol_deltaP: 24.0  sol_deltaP - sol_taoP: 3.0  cl_i: 2372796.0  sol_c_i: 2372796.0  sol_gp_i: 0.0  total work: 2504618.0  wasted work: 0.5
    i: 19.0  l_i: 4.0  p_i: 29.0  al_i: 2.0  sol_a_i: 2.0  sol_g_i: 0.0  d_i: 12.0  sol_taoi: 2.0  sol_deltai: 11.0  sol_deltai - sol_taoi: 9.0  sol_taoP: 2.0  sol_deltaP: 5.0  sol_deltaP - sol_taoP: 3.0  cl_i: 2372796.0  sol_c_i: 2372796.0  sol_gp_i: 0.0  total work: 2372796.0  wasted work: 0.0
    i: 20.0  l_i: 4.0  p_i: 21.0  al_i: 2.0  sol_a_i: 2.0  sol_g_i: 0.0  d_i: 9.0  sol_taoi: 2.0  sol_deltai: 9.0  sol_deltai - sol_taoi: 7.0  sol_taoP: 2.0  sol_deltaP: 4.0  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: 21.0  l_i: 4.0  p_i: 0.0  al_i: 40.0  sol_a_i: 40.0  sol_g_i: 0.0  d_i: 56.0  sol_taoi: 40.0  sol_deltai: 48.0  sol_deltai - sol_taoi: 8.0  sol_taoP: 40.0  sol_deltaP: 44.0  sol_deltaP - sol_taoP: 4.0  cl_i: 2109152.0  sol_c_i: 2109152.0  sol_gp_i: 0.0  total work: 2109152.0  wasted work: 0.0
    i: 22.0  l_i: 6.0  p_i: 0.0  al_i: 24.0  sol_a_i: 24.0  sol_g_i: 0.0  d_i: 35.0  sol_taoi: 24.0  sol_deltai: 28.0  sol_deltai - sol_taoi: 4.0  sol_taoP: 24.0  sol_deltaP: 25.0  sol_deltaP - sol_taoP: 1.0  cl_i: 1054576.0  sol_c_i: 1054576.0  sol_gp_i: 0.0  total work: 1054576.0  wasted work: 0.0
    i: 23.0  l_i: 5.0  p_i: 29.0  al_i: 14.0  sol_a_i: 16.96031746031746  sol_g_i: 0.5920634920634921  d_i: 31.0  sol_taoi: 17.0  sol_deltai: 22.0  sol_deltai - sol_taoi: 5.0  sol_taoP: 17.0  sol_deltaP: 19.0  sol_deltaP - sol_taoP: 2.0  cl_i: 1318220.0  sol_c_i: 2156231.285714286  sol_gp_i: 0.
```

7946428571428572 total work: 2240974.0 wasted work: 0.3214285714285707

i: 24.0 l_i: 6.0 p_i: 0.0 aI_i: 11.0 sol_a_i: 15.0 sol_g_i: 0.5 d_i: 29.0 sol_taoi: 15.0 sol_deltai: 21.0 sol_deltai - sol_taoi: 6.0 sol_taoP: 15.0 sol_deltaP: 17.0 sol_deltaP - sol_taoP: 2.0 cI_i: 1581864.0 sol_c_i: 1845508.0 sol_gp_i: 0.14285714285714285 total work: 1845508.0 wasted work: 0.0

i: 25.0 l_i: 6.0 p_i: 12.0 aI_i: 28.0 sol_a_i: 32.0 sol_g_i: 0.4 d_i: 62.0 sol_taoi: 32.0 sol_deltai: 38.0 sol_deltai - sol_taoi: 6.0 sol_taoP: 32.0 sol_deltaP: 34.0 sol_deltaP - sol_taoP: 2.0 cI_i: 1581864.0 sol_c_i: 1977330.0 sol_gp_i: 0.75 total work: 2109152.0 wasted work: 0.5

i: 26.0 l_i: 4.0 p_i: 5.0 aI_i: 51.0 sol_a_i: 57.0 sol_g_i: 0.8571428571428571 d_i: 80.0 sol_taoi: 57.0 sol_deltai: 66.0 sol_deltai - sol_taoi: 9.0 sol_taoP: 57.0 sol_deltaP: 60.0 sol_deltaP - sol_taoP: 3.0 cI_i: 2372796.0 sol_c_i: 2372796.0 sol_gp_i: 0.0 total work: 2372796.0 wasted work: 0.0

i: 27.0 l_i: 5.0 p_i: 24.0 aI_i: 27.0 sol_a_i: 30.0 sol_g_i: 0.42857142857142855 d_i: 46.0 sol_taoi: 30.0 sol_deltai: 35.0 sol_deltai - sol_taoi: 5.0 sol_taoP: 30.0 sol_deltaP: 32.0 sol_deltaP - sol_taoP: 2.0 cI_i: 1318220.0 sol_c_i: 3163728.0 sol_gp_i: 0.875 total work: 3163728.0 wasted work: 0.0

i: 28.0 l_i: 6.0 p_i: 12.0 aI_i: 21.0 sol_a_i: 25.0 sol_g_i: 0.6666666666666666 d_i: 45.0 sol_taoi: 25.0 sol_deltai: 31.0 sol_deltai - sol_taoi: 6.0 sol_taoP: 25.0 sol_deltaP: 27.0 sol_deltaP - sol_taoP: 2.0 cI_i: 1581864.0 sol_c_i: 2900084.0 sol_gp_i: 1.0 total work: 3163728.0 wasted work: 1.0

i: 29.0 l_i: 4.0 p_i: 29.0 aI_i: 29.0 sol_a_i: 34.0 sol_g_i: 0.5555555555555556 d_i: 55.0 sol_taoi: 34.0 sol_deltai: 39.0 sol_deltai - sol_taoi: 5.0 sol_taoP: 34.0 sol_deltaP: 36.0 sol_deltaP - sol_taoP: 2.0 cI_i: 1318220.0 sol_c_i: 2240974.0 sol_gp_i: 0.4375 total work: 2240974.0 wasted work: 0.0

Time: 537.000000