```
"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=54368

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_ECCG_deterministic.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 for deterministic model

Set parameter MIPGap to value 0.01
      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 =  1572.0                  ub =  1572.0
       MPObj =  1572.0       MP_delete_Hua_Obj =  852.0       Hua =  720.0       SPObj =  852.0       Deter_SP_Obj =  720.0

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: 8.0  aI_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  cI_i: 1581864.0  sol_c_i: 1581864.0  sol_gp_i: 0.0  total work: 1845508.0  wasted work: 1.0
    i: 1.0  l_i: 4.0  p_i: 21.0  aI_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  cI_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: 30.0  aI_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  cI_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: 6.0  aI_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  cI_i: 1845508.0  sol_c_i: 1845508.0  sol_gp_i: 0.0  total work: 1845508.0  wasted work: 0.0
    i: 4.0  l_i: 5.0  p_i: 18.0  aI_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  cI_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  aI_i: 25.0  sol_a_i: 25.0  sol_g_i: 0.0  d_i: 32.0  sol_taoi: 25.0  sol_deltai: 34.0  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: 2372796.0  wasted work: 0.0
    i: 6.0  l_i: 4.0  p_i: 2.0  aI_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  cI_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: 29.0  aI_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: 24.0  sol_deltaP - sol_taoP: 3.0  cI_i: 2109152.0  sol_c_i: 2109152.0  sol_gp_i: 0.0  total work: 3163728.0  wasted work: 4.0
    i: 8.0  l_i: 4.0  p_i: 0.0  aI_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  cI_i: 1054576.0  sol_c_i: 1054576.0  sol_gp_i: 0.0  total work: 1581864.0  wasted work: 2.0
    i: 9.0  l_i: 5.0  p_i: 29.0  aI_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  cI_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: 2.0  aI_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  cI_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: 17.0  aI_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  cI_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  aI_i: 28.0  sol_a_i: 28.0  sol_g_i: 0.0  d_i: 34.0  sol_taoi: 30.0  sol_deltai: 35.0  sol_deltai - sol_taoi: 5.0  sol_taoP: 30.0  sol_deltaP: 31.0  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: 13.0  l_i: 6.0  p_i: 18.0  aI_i: 31.0  sol_a_i: 31.0  sol_g_i: 0.0  d_i: 38.0  sol_taoi: 33.0  sol_deltai: 39.0  sol_deltai - sol_taoi: 6.0  sol_taoP: 33.0  sol_deltaP: 34.0  sol_deltaP - sol_taoP: 1.0  cI_i: 1581864.0  sol_c_i: 1581864.0  sol_gp_i: 0.0  total work: 1581864.0  wasted work: 0.0
    i: 14.0  l_i: 4.0  p_i: 12.0  aI_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: 13.0  sol_deltaP - sol_taoP: 3.0  cI_i: 1581864.0  sol_c_i: 1581864.0  sol_gp_i: 0.0  total work: 2109152.0  wasted work: 2.0
    i: 15.0  l_i: 6.0  p_i: 4.0  aI_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  cI_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: 17.0  aI_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  cI_i: 1054576.0  sol_c_i: 1054576.0  sol_gp_i: 0.0  total work: 1186398.0  wasted work: 0.5
    i: 17.0  l_i: 5.0  p_i: 0.0  aI_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: 56.0  sol_deltaP - sol_taoP: 4.0  cI_i: 2372796.0  sol_c_i: 2372796.0  sol_gp_i: 0.0  total work: 2636440.0  wasted work: 1.0
    i: 18.0  l_i: 6.0  p_i: 23.0  aI_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: 25.0  sol_deltaP - sol_taoP: 4.0  cI_i: 2372796.0  sol_c_i: 2372796.0  sol_gp_i: 0.0  total work: 2372796.0  wasted work: 0.0
    i: 19.0  l_i: 4.0  p_i: 25.0  aI_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  cI_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: 13.0  aI_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  cI_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  aI_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  cI_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  aI_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  cI_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: 25.0  aI_i: 14.0  sol_a_i: 14.0  sol_g_i: 0.0  d_i: 31.0  sol_taoi: 14.0  sol_deltai: 19.0  sol_deltai - sol_taoi: 5.0
```

```
sol_taoP: 14.0 sol_deltaP: 15.0 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: 24.0 l_i: 6.0 p_i: 0.0 al_i: 11.0 sol_a_i: 11.0 sol_g_i: 0.0 d_i: 29.0 sol_taoi: 11.0 sol_deltai: 17.0 sol_deltai - sol_taoi: 6.0 sol_taoP: 11.0 sol_deltaP: 13.0 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: 25.0 l_i: 6.0 p_i: 12.0 al_i: 28.0 sol_a_i: 28.0 sol_g_i: 0.0 d_i: 62.0 sol_taoi: 28.0 sol_deltai: 34.0 sol_deltai - sol_taoi: 6.0 sol_taoP: 28.0 sol_deltaP: 29.0 sol_deltaP - sol_taoP: 1.0 cl_i: 1581864.0 sol_c_i: 1581864.0 sol_gp_i: 0.0 total work: 1845508.0 wasted work: 1.0
    i: 26.0 l_i: 4.0 p_i: 5.0 al_i: 51.0 sol_a_i: 51.0 sol_g_i: 0.0 d_i: 80.0 sol_taoi: 51.0 sol_deltai: 60.0 sol_deltai - sol_taoi: 9.0 sol_taoP: 51.0 sol_deltaP: 54.0 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: 27.0 l_i: 5.0 p_i: 18.0 al_i: 27.0 sol_a_i: 27.0 sol_g_i: 0.0 d_i: 46.0 sol_taoi: 27.0 sol_deltai: 32.0 sol_deltai - sol_taoi: 5.0 sol_taoP: 27.0 sol_deltaP: 28.0 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: 28.0 l_i: 6.0 p_i: 12.0 al_i: 21.0 sol_a_i: 21.0 sol_g_i: 0.0 d_i: 45.0 sol_taoi: 21.0 sol_deltai: 27.0 sol_deltai - sol_taoi: 6.0 sol_taoP: 21.0 sol_deltaP: 23.0 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: 29.0 l_i: 4.0 p_i: 25.0 al_i: 29.0 sol_a_i: 29.0 sol_g_i: 0.0 d_i: 55.0 sol_taoi: 31.0 sol_deltai: 36.0 sol_deltai - sol_taoi: 5.0 sol_taoP: 31.0 sol_deltaP: 32.0 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
Time: 399.000000
```