

OPT HW4 problem 7

November 17, 2019

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[ ]: from gurobipy import *

# create a model
m = Model()

# create variables
ab = m.addVar(vtype=GRB.INTEGER, name="ab", lb=0)
ac = m.addVar(vtype=GRB.INTEGER, name="ac", lb=0)
da = m.addVar(vtype=GRB.INTEGER, name="da", lb=0)
ae = m.addVar(vtype=GRB.INTEGER, name="ae", lb=0)
af = m.addVar(vtype=GRB.INTEGER, name="af", lb=0)
ag = m.addVar(vtype=GRB.INTEGER, name="ag", lb=0)
bc = m.addVar(vtype=GRB.INTEGER, name="bc", lb=0)
db = m.addVar(vtype=GRB.INTEGER, name="db", lb=0)
be = m.addVar(vtype=GRB.INTEGER, name="be", lb=0)
fb = m.addVar(vtype=GRB.INTEGER, name="fb", lb=0)
gb = m.addVar(vtype=GRB.INTEGER, name="gb", lb=0)
cd = m.addVar(vtype=GRB.INTEGER, name="cd", lb=0)
ce = m.addVar(vtype=GRB.INTEGER, name="ce", lb=0)
fc = m.addVar(vtype=GRB.INTEGER, name="fc", lb=0)
cg = m.addVar(vtype=GRB.INTEGER, name="cg", lb=0)
de = m.addVar(vtype=GRB.INTEGER, name="de", lb=0)
fd = m.addVar(vtype=GRB.INTEGER, name="fd", lb=0)
dg = m.addVar(vtype=GRB.INTEGER, name="dg", lb=0)
fe = m.addVar(vtype=GRB.INTEGER, name="fe", lb=0)
ge = m.addVar(vtype=GRB.INTEGER, name="ge", lb=0)
fg = m.addVar(vtype=GRB.INTEGER, name="fg", lb=0)

ba = m.addVar(vtype=GRB.INTEGER, name="ba", lb=0)
ca = m.addVar(vtype=GRB.INTEGER, name="ca", lb=0)
ad = m.addVar(vtype=GRB.INTEGER, name="ad", lb=0)
ea = m.addVar(vtype=GRB.INTEGER, name="ea", lb=0)
fa = m.addVar(vtype=GRB.INTEGER, name="fa", lb=0)
ga = m.addVar(vtype=GRB.INTEGER, name="ga", lb=0)
cb = m.addVar(vtype=GRB.INTEGER, name="cb", lb=0)
bd = m.addVar(vtype=GRB.INTEGER, name="bd", lb=0)
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eb = m.addVar(vtype=GRB.INTEGER, name="eb", lb=0)
bf = m.addVar(vtype=GRB.INTEGER, name="bf", lb=0)
bg = m.addVar(vtype=GRB.INTEGER, name="bg", lb=0)
dc = m.addVar(vtype=GRB.INTEGER, name="dc", lb=0)
ec = m.addVar(vtype=GRB.INTEGER, name="ec", lb=0)
cf = m.addVar(vtype=GRB.INTEGER, name="cf", lb=0)
gc = m.addVar(vtype=GRB.INTEGER, name="gc", lb=0)
ed = m.addVar(vtype=GRB.INTEGER, name="ed", lb=0)
df = m.addVar(vtype=GRB.INTEGER, name="df", lb=0)
gd = m.addVar(vtype=GRB.INTEGER, name="gd", lb=0)
ef = m.addVar(vtype=GRB.INTEGER, name="ef", lb=0)
eg = m.addVar(vtype=GRB.INTEGER, name="eg", lb=0)
gf = m.addVar(vtype=GRB.INTEGER, name="gf", lb=0)

# integrate new variables
m.update()

# set objective
m.setObjective(
    0.003*(ab + ac + da + ae + af + ag + bc + db + be + fb + gb + cd + ce + fc
    ↪ cg + de + fd + dg + fe + ge + fg + ba + ca + ad + ea + fa + ga + cb + bd +
    ↪ eb + bf + bg + dc + ec + cf + gc + ed + df + gd + ef + eg + gf),
    GRB.MINIMIZE
)

# add constraints
m.addConstr(-1*(ab + ac + ad + ae + af + ag) + ba + ca + da + ea + fa + ga ==
    ↪ -1*(62))
m.addConstr(-1*(ba + bc + bd + be + bf + bg) + ab + cb + db + eb + fb + gb ==
    ↪ -1*(-1*117))
m.addConstr(-1*(ca + cb + cd + ce + cf + cg) + ac + bc + dc + ec + fc + gc ==
    ↪ -1*(81))
m.addConstr(-1*(da + db + dc + de + df + dg) + ad + bd + cd + ed + fd + gd ==
    ↪ -1*(145))
m.addConstr(-1*(ea + eb + ec + ed + ef + eg) + ae + be + ce + de + fe + ge ==
    ↪ -1*(-1*128))
m.addConstr(-1*(fa + fb + fc + fd + fe + fg) + af + bf + cf + df + ef + gf ==
    ↪ -1*(105))
m.addConstr(-1*(ga + gb + gc + gd + ge + gf) + ag + bg + cg + dg + eg + fg ==
    ↪ -1*(-1*148))

# optimize
m.optimize()
print("Model status: ", m.status)

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# print out decision variables
for v in m.getVars():
    print(v.varName, v.x, "\n")

print("-"*15)
print("Obj Value: ", m.objVal)

'''
obj value: 1.179
ab 12.0
ae 47.0
ag 3.0
fb 105.0
ce 81.0
dg 145.0

ac 0.0
da 0.0
af 0.0
bc 0.0
db 0.0
be 0.0
gb 0.0
cd 0.0
fc 0.0
cg 0.0
de 0.0
fd 0.0
fe 0.0
ge 0.0
fg 0.0
ba 0.0
ca 0.0
ad 0.0
ea 0.0
fa 0.0
ga 0.0
cb 0.0
bd 0.0
eb 0.0
bf 0.0
bg 0.0
dc 0.0
ec 0.0
cf 0.0
gc 0.0

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```
ed 0.0  
df 0.0  
gd 0.0  
ef 0.0  
eg 0.0  
gf 0.0  
' ' ' ' ' '
```