Advanced Automation and Control

Optimization Part

Surname..... Name.....

Tuesday 17th September, 2019

Exercise 1

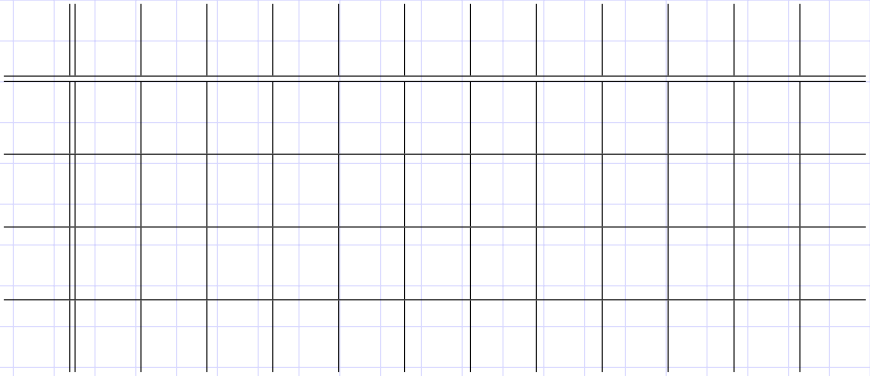
1. Rewrite the optimization problem in **standard form**

2. Depict the tree associated to the MILP and write down the problem at node 0 (the relaxation of the original MILP problem)

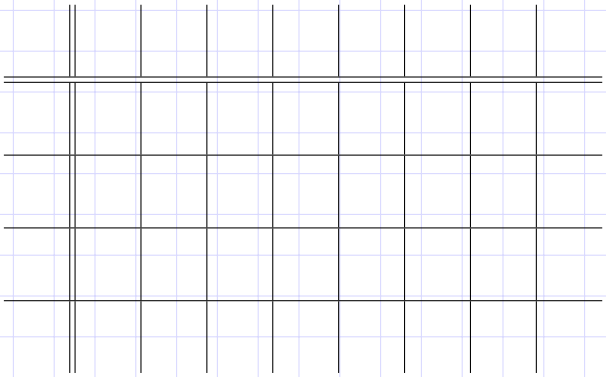
3. Simplex algorithm at node 0

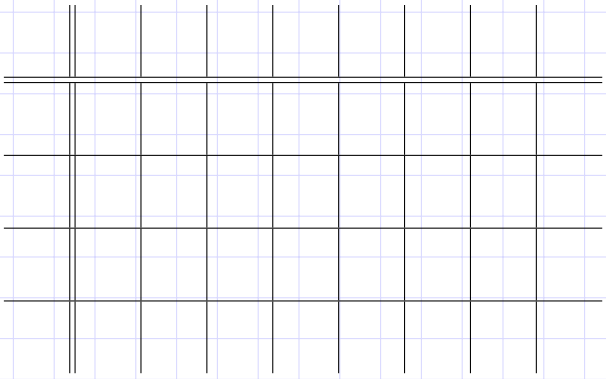
(a) Write the optimization problem for Phase 1

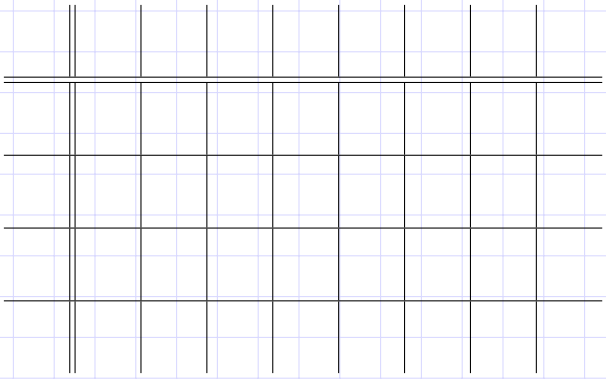
(b) Solve Phase 1

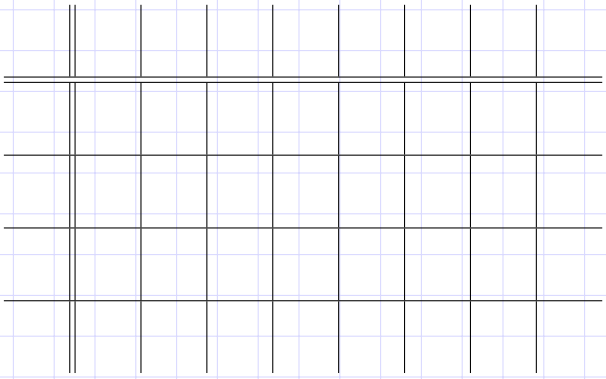


(c) Simplex algorithm **Phase 2** (complete from left to right and from up to down)









(d) The optimal cost is

(e) The optimal solution is $x =$

(f) Is this solution feasible for the original MILP (Yes or No)?

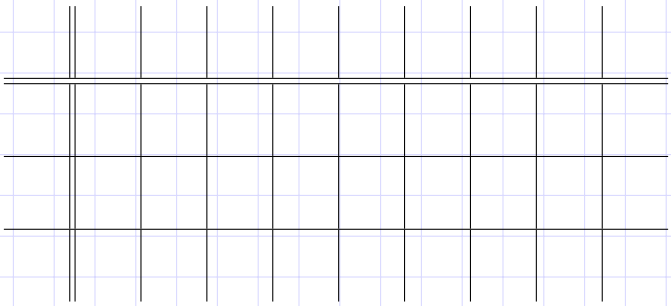
(g) Is this solution optimal for the original MILP (Yes or No)?

4. Write down the problem at node 1

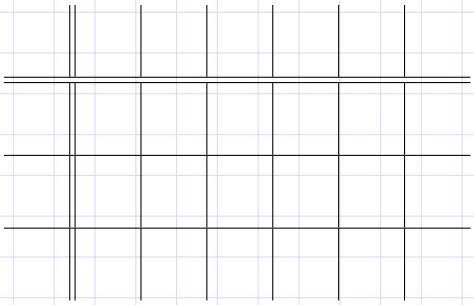
5. Simplex algorithm at node 1

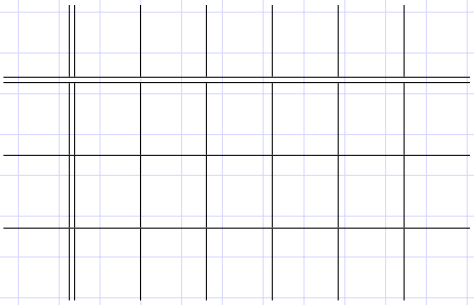
   (a) Write the optimization problem for Phase 1

   (b) Solve Phase 1



   (c) Simplex algorithm **Phase 2** (complete from left to right and from up to down)





(d) The optimal cost is

(e) The optimal solution is $x =$

(f) Is this solution feasible for the original MILP (Yes or No)?

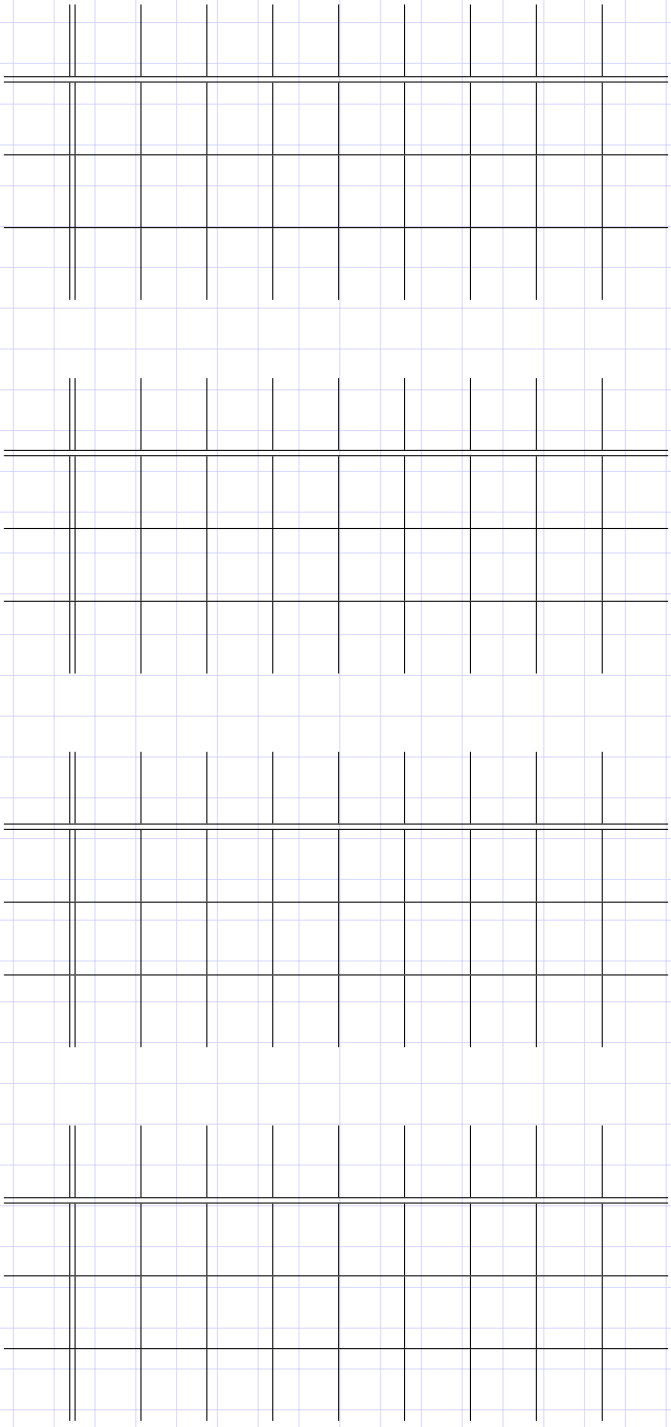
(g) According to the information available until this point, is this solution optimal for the original MILP (Yes or No)?

6. Write down the problem at node 2

7. Simplex algorithm at node 2

(a) Write the optimization problem for Phase 1

(b) Solve Phase 1



(c) The optimization problem at node 2 is

(d) After examining nodes 0, 1 and 2, one can conclude that

i. the optimal cost for the MILP is

ii. the optimal solution for the MILP is $x =$

Exercise 2

1. Indicate the optimization variables and their meaning

2. Please, report the all the steps required to obtain the MILP formulation of the problem

3. Write down the final **linear** objective function

4. Write down all the constraints

Exercise 3

1. Indicate if the cost function is convex (motivate the answer).

2. Depict the feasibility domain of the problem.

3. Indicate if the optimisation problem is convex (motivate the answer).

Exercise 4