Advanced Automation and Control

Optimization Part

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

Thursday 11th July, 2019

Exercise 1

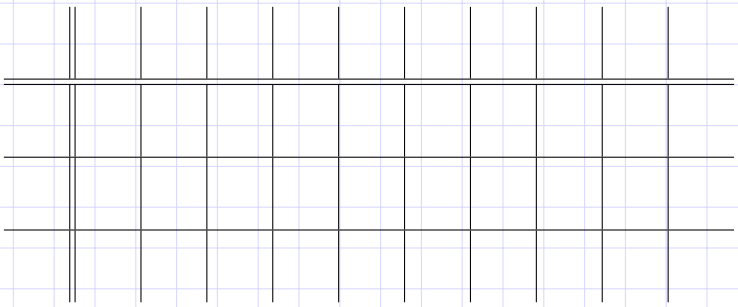
1. Rewrite the optimization problem in **standard form**

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

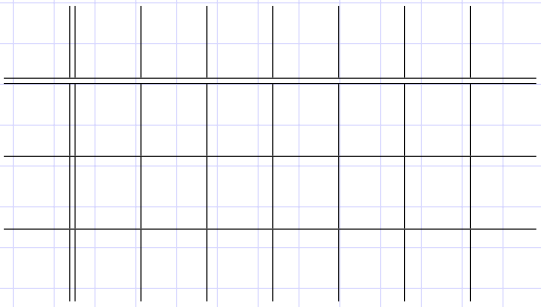
3. Simplex algorithm at node 0

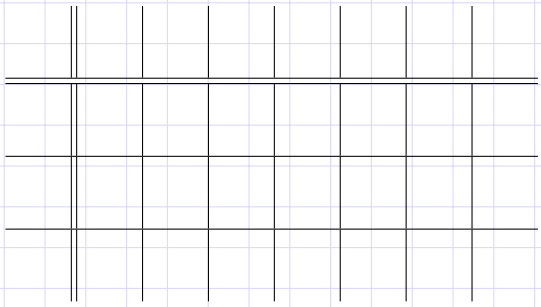
(a) Write the optimization problem for Phase 1

(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)?

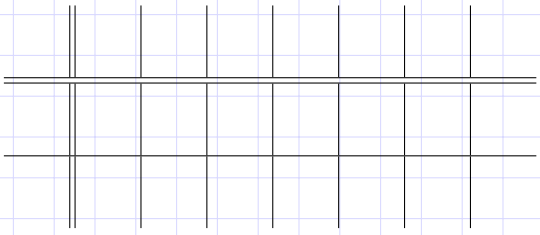
(g) Is this solution optimal for the original MILP (Yes or No)?

4. Write down the problem at node 1

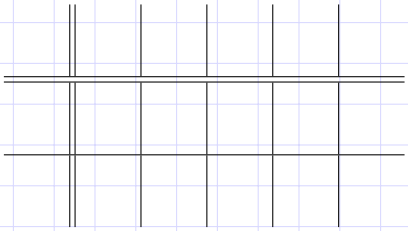
5. Simplex algorithm at node 1

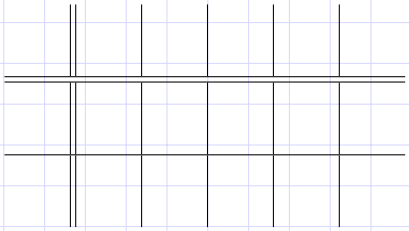
(a) Write the optimization problem for Phase 1

(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)?

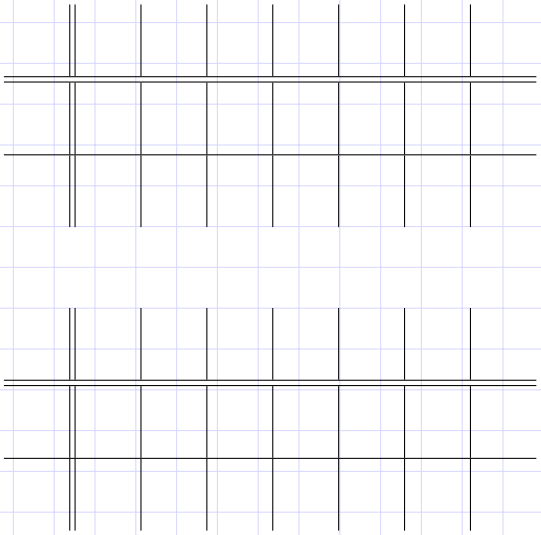
(g) Is this solution optimal for the original MILP (Yes or No)?

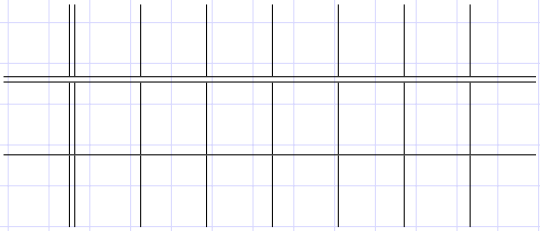
6. Write down the problem at node 2

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