

# Advanced Automation and Control

## Optimization Part

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

Thursday 23<sup>rd</sup> September, 2021

### **Exercise 1**

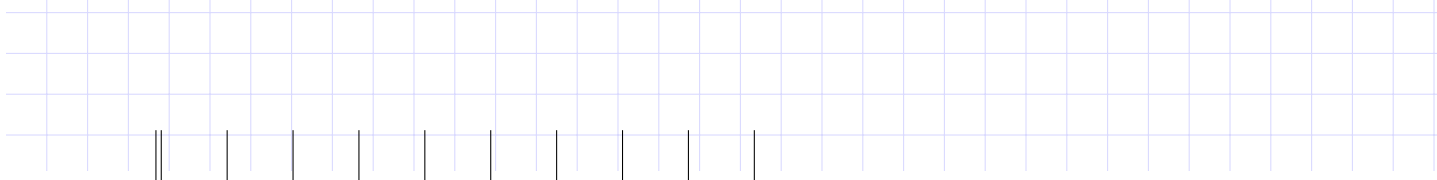
1. Rewrite the optimization problem in **standard form**. Depict the tree associated to the MILP.

2. Write down the relaxed problem at node 0 **and** the optimization problem for Phase 1.



3. Simplex algorithm at node 0

(a) Solve Phase 1



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











(c) The optimal cost is


(d) The optimal solution is  $x =$

(e) Is this solution feasible for the original MILP (Yes or No and Why)?

(f) Is this solution optimal for the original MILP (Yes or No and Why)?



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3. Write down the final set of optimization variables (after having resolved bilinearities etc.) and their meaning

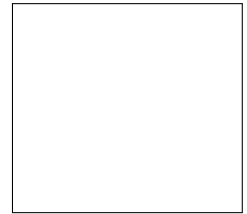


4. Write down the final **linear** objective function

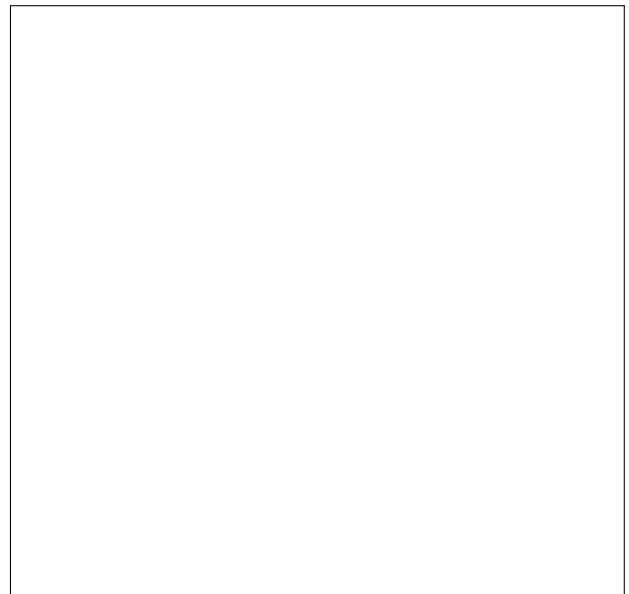
5. Write down all the constraints

### Exercise 3

1. Depict the cost function (IN THE BOX) and indicate if it is convex (IN THE SMALL BOX) and motivate the answer OUT OF THE BOX).



2. Depict the feasibility domain of the problem (IN THE BOX). Moreover, answer to question 3.2. In particular, answer YES/NO IN THE SMALL BOX and motivate the answer OUT OF THE BOX.







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

## Exercise 4

