

IE 407 Fundamentals of OR

Spring 2024

Assignment 3

Due date: June 14, 2024 at 23.59

Please upload a single .zip file for this assignment. The .zip file should include a report in “.pdf” format and two solver files (one file for each question). Your report should not exceed 6 pages.

Question 1. (50 points) Tasch Co. manufactures microprocessors (MP) to use in the production of PC CPUs (PC) and Tablet CPUs (T). Every week, Tasch Co. has the opportunity to sell as many PCs and Ts as the market demands. The production times for one unit of MP, T, and PC are one, two, and five hours, respectively, with 120 working hours available each week.

PC and T production requires 8 and 4 MPs respectively. At the beginning of this week, there are 80 MPs in the stock. The production cost of each MP is \$2, and the selling prices of PC and T are \$50 and \$30, respectively.

- a) Develop a linear programming model to maximize the profit of Tasch Co. Clearly state your decision variables, constraint, and objective function. Briefly explain each of them.
- b) Solve the model using the simplex method. Show each iteration with a simplex table. In each iteration explain the entering and leaving variables using your reasoning. For this part, you can use photos or screenshots of your handwritten solutions in your report.
Make sure your handwriting is clear.
- c) Model and solve the model with a modeling language and solver of your choice (preferably Excel or Pyomo). Provide the screenshots of your solution and upload the model file you used (.xls or .py).

Question 2. (50 points) Consider following MIP model.

$$\text{Max } z = 8x_1 + 6x_2 + 2x_3$$

s. to:

$$6x_1 + 4x_2 + 2x_3 \leq 14$$

$$4x_1 + 2x_2 + 4x_3 \leq 22$$

$$x_1, x_2, x_3 \geq 0$$

x_2 and x_3 are integer.

- Solve the model using the branch and bound method by using the simplex method in each node. For this part, you can use photos or screenshots of your handwritten solutions in your report. Make sure your handwriting is clear.
- Model and solve the model with a modeling language and solver of your choice (preferably Excel or Pyomo). Provide the screenshots of your solution and upload the model file you used (.xls or .py).

Hint: With the add constraint button on the solver interface of Excel, you can select a variable and choose the “int” option from the dropdown menu to define a variable as an integer.

