Fundamentals of Operational Research
Assignment 2
School of Mathematics
The University of Edinburgh
Year 2022/2023

INSTRUCTIONS:

1. This assignment is individual and it is worth 10% of the mark of the course.

2. You must consider this as an exam that you do at home. The same policy than in an exam will be applied for assignments with signs of plagiarism. This is a serious academic offence.

3. The submission deadline is Wednesday 16 November at 14:00 on Gradescope.

4. Provide clear answers and justify every argument that you use. This does not mean to explain in twenty lines what can be said in two. Neither to explain in two words what requires two or three lines. There is no minimum or maximum number of pages that you can submit, but take into account these guidelines.

1) (10 marks) A firm has 4 marketing plans and 2 production plans that can adopt. The decisions are taken using an integer programming model. The business analyst in charge of the model only took Fundamentals of Operational Research during his undergraduate studies, which means that sadly the lecturer never taught him to solve a nonlinear optimization model. Answer the first question and formulate the three conditions that follow, but do not use any nonlinear expression:

(a) **(1 mark)** Define the necessary variables that represent the decisions on which plans are adopted.

(b) **(1 mark)** At least one of the marketing plans must be adopted.

(c) **(3 marks)** Only one of the marketing plans ca be implemented by the company. Any additional marketing plan must be outsourced to an external agency at a cost of c monetary units per outsourced plan.

(d) **(5 marks)** Production plan 1 is impossible if marketing plan 2 is adopted and marketing plan 1 is not adopted. *Note: You must use and explain step by step in this question d one or more of the methods seen in class.*