OLLSCOIL NA GAILLIMHE
UNIVERSITY OF GALWAY

MS5107 BUSINESS MODELLING & ANALYTICS

Mid-Term Assignment 1

Optimisation Techniques

Assignment:

Performance Lawn Equipment (PLE) produces mowers and tractors in several manufacturing facilities. Because of popularity of their products, PLE have always sold their production and usually the number of mowers sold was at least twice the number of tractors sold. One of the PLE manufacturing facilities produces engine housing from sheet metal for both mowers and tractors. Production of each product consists of five consecutive steps, which workers do in five departments: Stamping, Drilling, Assembly, Painting, and Packaging to ship products to the final assembly plant. The production rates in hours per unit and the number of hours available in each department are given in the following table:

Department	*Mower Housing*	*Tractor Housing*	*Hours Available*
Stamping	0.2	0.3	200
Drilling	0.3	0.4	300
Assembly	0.25	0.35	225
Painting	0.17	0.25	220
Packaging	0.05	0.1	100

In addition, mover housing requires 1.6 square feet of sheet metal and 100 millilitres of paint per unit and tractor housing requires 1.7 square feet of sheet metal and 320 millilitres paint per unit. Currently the company has in stock 1440 square feet of sheet metal and 40 buckets of paint, 10 litres each. The net profit made from one mower housing is €190 and the profit from one tractor housing is €260.

PLE would like to determine a production plan that maximises the profit from the housing production.

Formulate and solve a linear optimisation model, using Solver, and prepare a written report with your recommendations to the company management. Illustrate your report with screenshots showing the model formulation and solution, Solver dialog box, and reports and discuss them.
Interpreting reports only (where possible) you may discuss interesting scenarios, such as:

- what would happen if a fraction of the production is returned for re-painting due to defects and a number of buckets of paint cannot be used due to expiry date;
- if the PLE manager considers allowing the workforce to work additional hours at an overtime premium of €X per hour, would this be a good suggestion?
- if either mowers or tractors are not recommended to be produced, what would make the company to start producing them?
- … or anything else you deem interesting.

Requirements:

- Work individually. Avoid plagiarism – *"…act of copying, from the work of another.... Plagiarism can apply to words, ideas, images, information, data, approaches or methods.*" www.universityofgalway.ie/plagiarism
- Submit two files to the Blackboard drop box provided:
    a. MS Excel file containing the model. Name the file using your ID, module code, and assignment number (e.g. 1187404_MS5107_A1.xlsx).
    b. Written report as required, which is a document (**doc** or **docx**) of up to about 800 words, printed in Times New Roman font, 12-point, single spaced (or up to 3-4 pages text and images inclusive). **Use cover page** provided. Name the file using your ID, module code, and assignment number (e.g. 1187404_MS5107_A1.docx).
- The assignment is due on or before **Wed, 12th Oct 2022**, and carries 15% of the total marks.