MATH3082 Optimization (2019-20 Class)

Coursework

This piece of work will account for 15% of the overall mark for MATH3082. It has two major parts. The first part is about a self-study report on some topics in Linear Programming that have not been covered by our course. For example, you may talk about some of the following topics (but not restricted to this list). You may add new topics of your own, which are not covered by our course.

- Branch and Bound methods
- Conic Linear Programming
- Cutting plane methods
- Integer Linear Programming
- Network Flow Problems
- Parametric Linear Programming
- Revised Simplex Method
- The Dual Simplex Method
- Zero-Sum Games.

It is expected to your report should cover at least **Two** new topics.

The second part is about formulating the given problem (see the last page of this coursework) as an integer linear programming problem. It is intended that you carry out the analysis of the problem using the mathematical programming package Xpress-IVE.

Completed work should be handed in to the Faculty Student Office of Social Sciences (B2) by 16:00, April 29 (Wednesday), 2020.

The deadline is strict. However, late submission up to five days after the deadline is also accepted, but with 10% penalty each day (e.g., for work submitted on the fifth working day after the deadline it will only receive 50% of the total credit awarded). Therefore, no credit will be given for late submissions more than five days after the deadline.

Your report should be computer processed by using certain software of your own choice. Ensure that you take frequent and multiple backups of your work, since excuses concerning lost or corrupted files will not be treated sympathetically.

As a very rough guide, I would like about 8 (but no more than 12) A4 sides of description, with any extra material (e.g., Xpress-IVE code, computer output) attached at the end. Your report should include:

- Self-study report on integer linear programming. This part accounts for 60% of the whole coursework.
- the formulation of your model with a statement of any assumptions made;
- a brief description of how you solved it;
- a presentation of the results;
- a summary of recommended policies that should be followed (and possible suggestions for further investigations).

You are expected to complete the coursework without help from staff. Limited assistance will be available from a postgraduate tutor, who will also supervise the 4 computer laboratory sessions to introduce Xpress-IVE. Sessions are to take place in Weeks 23, 24, 29 and 30. Please check your timetables for the computer sessions.

Hou-Duo Qi
March 2020

STAFF SCHEDULING

A cafeteria in Southampton is open from 9 am to 5 pm. Staffing is done in the following manner: a full-time employee works 7 hours including a one-hour break in the middle (and is paid for his break), whilst a part-time employee works 4 hours consecutively. The number of employees required per time-slot is displayed in the following table.

Period	Number of employees required
9am-10am	6
10am-11am	5
11am-12noon	7
12noon-1pm	8
1pm-2pm	8
2pm-3pm	7
3pm-4pm	5
4pm-5pm	6

If at least 4 full-time employees must be hired, and given that a full-timer costs £12 per hour whereas a part-timer costs £7.5 per hour, build a linear programming model that will minimize the labour cost whilst preserving customer service.

Include any other analysis that may be relevant in supporting the decision-making process and comment on overstaffing.