ECON2320/7322

Assignment 1

Linear and Integer Programming

Due Date: 2 pm, 29 August 2016

Submission: Faculty Resource Centre, Level 1, Colin Clark Building (#39).

Note: Marks will be awarded for selection of appropriate methods/formulas,
computation of correct numerical answers, and interpretation of results. Please
provide printouts of your POM/QM or Excel input and output tables.
Answers can be neatly hand-written. Electronic submission is <u>not</u> required.

Question 1:

The Whitt Window Company is a company with only three employees which makes two
different kinds of hand-crafted windows: a wood-framed and an aluminum-framed window.
They earn $180 profit for each wood-framed window and $90 profit for each aluminum-
framed window. John makes the wood frames, and can make 6 per day. Linda makes the
aluminum frames, and can make 4 per day. Bob forms and cuts the glass, and can make 48
square feet of glass per day. Each wood-framed window uses 6 square feet of glass and
each aluminum-framed window uses 8 square feet of glass.

   a) Formulate an LP that can be used to maximise profit.
   b) Can you solve this problem graphically? If yes, provide the solution using the
      graphical method.
   c) Solve the LP using POM/QM or Excel and interpret the optimal solution.
   d) Interpret the *Allowable Minimum* and *Allowable Maximum* values for Bob's constraint.
   e) Interpret the dual values associated with each constraint.
   f) Formulate the dual of this problem and interpret the optimal solution.

Note: For the purpose of obtaining POM/QM or Excel output with sensitivity analysis,
assume that the optimal solution values do not need to be integers.

Question 2:

A company is planning to service a number of new retail shops in 3 different cities. To do so, the company is considering three sites (A, B & C) in order to build warehouses for the shipment to the shops. The three different sites have the following estimated monthly fixed costs $11,000, $13,000 and $9,000 respectively. The three cities have anticipated demands as follow: city 1 requires 350 units per month, city 2 requires 240 units per month, and city 3 requires 900 units per month. The table below shows the costs of sending 1 item to each city retail shop from each warehouse (and the overall maximal supply of each warehouse). The company wishes to meet monthly demands at minimum cost, subject to following constraints:

a) At most 2 warehouses must be opened.
b) If warehouse B is opened, then warehouse A must also be opened.

Formulate an LP that can be used to minimise the monthly costs of meeting demand. Find the optimal solution using POM/QM and state the outcomes. Use if-then constraints in the formulation of the problem.

	Supply	City 1	City 2	City 3
Warehouse A	1100	36	28	31
Warehouse B	1350	26	38	22
Warehouse C	1400	37	34	32