

620-261 Introduction to Operations Research

ASSIGNMENT 7

Post in boxes by 3.00 pm on Monday 5th May 2008

1. Write the dual of the following linear programming problem by first writing it in standard form.

$$\begin{aligned} \max \quad & 3x_1 + 2x_2 - x_4 \\ \text{subj to} \quad & 4x_1 + 3x_2 + x_3 = 10 \\ & 5x_1 - 6x_2 + x_3 \leq 12 \\ & 6x_1 + 7x_2 \geq 11 \\ & x_1 \geq 0, x_3 \geq 0, x_4 \geq 0, x_2 \text{ } \textit{urs} \end{aligned}$$

2. Consider the linear program, P , given by

$$\text{Maximise } z = x_1 + 4x_2 + 3x_3$$

subject to

$$\begin{aligned} x_1 + 5x_2 + 4x_3 &\leq 14 \\ 3x_1 + 2x_2 + x_3 &\leq 4 \end{aligned}$$

with x_1, x_2 and x_3 non-negative.

- (i) Write down D , the dual of P .
 - (ii) Solve P using the simplex algorithm.
 - (iii) Write down the optimal solution of D .
3. Consider the linear program, P , given by

$$\text{Maximise } z = x_1 - x_2 + 3x_3$$

subject to

$$\begin{aligned} 2x_1 + x_2 + 5x_3 &\leq 6 \\ -3x_1 - 2x_2 + 4x_3 &\leq -3 \end{aligned}$$

with x_1, x_2 and x_3 non-negative.

- (i) Write down D , the dual of P .
- (ii) Solve P using the simplex algorithm.
- (iii) By observing the optimal tableau of P , write down the optimal solution of D . Verify that this is a feasible solution for D .