

620-261 Introduction to Operations Research

TUTORIAL 8 supplement

1. The primal LP (P),

Maximise

$$z = 30x_1 + 6x_2 - 5x_3 + 18x_4, \quad (1)$$

such that

$$\begin{aligned} x_1 + 2x_3 + x_4 &\leq 20 \\ -2x_1 + x_2 - x_4 &\leq 15 \\ 6x_1 + 2x_2 - 3x_3 &\leq 54 \end{aligned}$$

and x_1, x_2, x_3 and x_4 are all non-negative, has optimal solution $x_1^* = x_3^* = 0, x_2^* = 27, x_4^* = 20$ and $z^* = 522$.

(a) Write down D , the dual of P .

(b) Use the complementary slackness theorem to find the optimal solution of D .

2. Consider the LP (P)

Maximise

$$z = x_1 - x_2, \quad (2)$$

such that

$$\begin{aligned} -2x_1 + x_2 &\leq 2 \\ x_1 - 2x_2 &\leq 2 \\ x_1 + x_2 &\leq 5 \end{aligned}$$

and x_1 and x_2 are all non-negative. A proposed solution is $\mathbf{x}^* = (1, 4)$. Use the complementary slackness theorem to test whether it is optimal. You will have to write out the dual.