

INDU 6111 Theory of Operations Research
 Homework Assignment 2
 Due on Wednesday October 12 in class.
 Late homeworks will not be accepted.

Please, print out the Expectation of Originality Form
 (available from a link on our class web page),
 fill it in, sign it, and attach it to your homework.

1. [10 points out of 40] For each of the three LP problems in Problem 2.1 (page 26), write down the dual problem and give optimal solutions of both the primal and the dual problems..

2. Use Theorem 5.3 to answer the following questions:

A. [10 points out of 40] True or false?

$$x_1^* = 1, x_2^* = 0, x_3^* = 1, x_4^* = 0, x_5^* = 2$$

is an optimal solution of the problem

$$\begin{array}{llllllll} \text{maximize} & 8x_1 & + & 8x_2 & + & 9x_3 & + & 6x_4 & + & 5x_5 \\ \text{subject to} & x_1 & - & x_2 & + & 2x_3 & - & x_4 & + & x_5 & \leq & 5, \\ & x_1 & + & x_2 & + & 3x_3 & + & 3x_4 & + & 2x_5 & \leq & 9, \\ & 3x_1 & + & x_2 & + & 2x_3 & + & 2x_4 & + & x_5 & \leq & 8, \\ & 2x_1 & + & 2x_2 & + & 2x_3 & + & x_4 & + & x_5 & \leq & 8, \\ & 2x_1 & + & 3x_2 & + & 2x_3 & + & 2x_4 & + & x_5 & \leq & 6, \\ & x_1 & + & x_2 & + & x_3 & + & x_4 & + & x_5 & \leq & 4, \\ & & & & & & & x_1, x_2, x_3, x_4, x_5 & \geq & 0. \end{array}$$

B. [10 points out of 40] True or false?

$$x_1^* = 1, x_2^* = 0, x_3^* = 1, x_4^* = 1, x_5^* = 1, x_6^* = 0$$

is an optimal solution of the problem

$$\begin{array}{llllllll} \text{maximize} & 8x_1 & + & 4x_2 & + & 6x_3 & + & 4x_4 & + & 3x_5 & + & 4x_6 & & \\ \text{subject to} & 2x_1 & - & x_2 & + & x_3 & + & x_4 & + & x_5 & + & 2x_6 & \leq & 5, \\ & 2x_1 & + & x_2 & + & 2x_3 & + & x_4 & + & 2x_5 & & & \leq & 8, \\ & 2x_1 & + & 2x_2 & + & 2x_3 & + & x_4 & + & x_5 & & & \leq & 6, \\ & 2x_1 & + & x_2 & + & x_3 & + & x_4 & & & + & x_6 & \leq & 4, \\ & x_1 & + & 2x_2 & + & x_3 & + & 2x_4 & + & 2x_5 & + & 2x_6 & \leq & 8, \\ & & & & & & & & & & & & x_1, x_2, x_3, x_4, x_5, x_6 & \geq & 0. \end{array}$$

C. [10 points out of 40] True or false?

$$x_1^* = 0, x_2^* = 1, x_3^* = 0, x_4^* = 1, x_5^* = 3, x_6^* = 0$$

is an optimal solution of the problem

$$\begin{array}{llllllll} \text{maximize} & 8x_1 & + & 9x_2 & + & 8x_3 & + & 7x_4 & + & 6x_5 & + & 8x_6 & & \\ \text{subject to} & 2x_1 & + & x_2 & + & x_3 & + & x_4 & + & x_5 & + & 2x_6 & \leq & 5, \\ & 3x_1 & + & x_2 & + & 2x_3 & + & x_4 & + & 2x_5 & + & 3x_6 & \leq & 9, \\ & x_1 & + & 2x_2 & + & x_3 & + & x_4 & + & x_5 & + & x_6 & \leq & 6, \\ & x_1 & + & x_2 & + & 3x_3 & + & x_4 & + & 2x_5 & + & 2x_6 & \leq & 9, \\ & 3x_1 & + & x_2 & + & 2x_3 & + & 2x_4 & + & x_5 & + & 3x_6 & \leq & 6, \\ & & & & & & & & & & & & x_1, x_2, x_3, x_4, x_5, x_6 & \geq & 0. \end{array}$$