

國立臺北科技大學九十五學年度碩士班招生考試

系所組別：4112 工業工程與管理系碩士班甲組

第二節 作業研究 (選考) 試題

填准考證號碼

第一頁 共一頁

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注意事項：

1. 本試題共四題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Consider the following LP, which is called problem P.

$$\text{Max } Z = 5X_1 + 12X_2 + 4X_3$$

$$\text{s.t. } X_1 + 2X_2 + X_3 \leq 10$$

$$2X_1 - X_2 + 3X_3 = 8$$

$$X_1, X_2, X_3 \geq 0$$

- (1) State the dual problem. (10%)
- (2) Solve this dual problem by the dual simplex method. (10%)
- (3) Use complementary slackness theorem to solve problem P. (10%)

2. Consider the following LP:

$$\text{Max } Z = 5X_1 + 2X_2 + c_3X_3$$

$$\text{s.t. } X_1 + 5X_2 + 2X_3 \leq b_1$$

$$X_1 + 5X_2 + 6X_3 \leq 10$$

$$X_1, X_2, X_3 \geq 0$$

Specific constant value of c_3, b_1 produce the following optimal tableau:

Basic	X_1	X_2	X_3	X_4	X_5	RHS
Z	0	a	7	d	e	150
X_1	1	b	2	1	0	30
X_2	0	c	-8	-1	1	10

- (1) Find the value of a and b_1 . (10%)
- (2) What is the value of c_3 so that the current optimal solution remains optimal? (10%)
- (3) Introduce a new variable X_4 with coefficient $[c_4, a_{14}, a_{24}]^T = [-1, -2, 1]^T$

Is the optimal solution remains unchanged? (10%)

3. Consider the following problem:

$$\text{Max } Z = 2X_1^2 + 4X_2 + X_3$$

$$\text{s.t. } 2X_1 + X_2 + 4X_3 \leq 8$$

$$X_1, X_2, X_3 \geq 0 \text{ and } X_1, X_2, X_3 \text{ are integers.}$$

Use dynamic programming to solve this problem. (20%)

4. Consider a Markov Chain with states 1, 2, 3, 4 and the transition probability matrix:

$$\begin{bmatrix} 0 & \frac{1}{4} & \frac{3}{4} & 0 \\ \frac{1}{4} & \frac{1}{2} & \frac{1}{4} & 0 \\ \frac{3}{4} & \frac{1}{4} & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

- (1) Which states in the state space of this Markov Chain are transient states? Which are absorbing states? (10%)
- (2) Do the limiting probabilities exist? If yes, find them. (10%)