

國立臺北科技大學九十八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 試題

第一頁 共一頁

注意事項：

1. 本試題共 5 題，每題 20 分，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 problem.

$$\text{Maximize } Z = 4x_1 + 2x_2 + 3x_3$$

subject to

$$3x_1 + x_2 + 2x_3 = 20$$

$$5x_1 + x_2 \geq 10$$

$$\text{and } x_1 \geq 0, x_2 \geq 0, x_3 \geq 0.$$

Let \bar{x}_4 be the artificial variable for the first constraint. Let x_5 and \bar{x}_6 be the

surplus variable and artificial variable, respectively, for the second constraint.

You are now given the information that a portion of the final simplex tableau is as follows:

Basic Variable	Eq.	Z	Coefficient of:					Right Side
			x_1	x_2	x_3	\bar{x}_4	x_5	
Z	(0)	1				M+2	0	M
x_2	(1)	0				1	0	0
x_5	(2)	0				1	1	-1

Use the revised simplex method to identify the missing numbers in the final simplex tableau. Show your calculations.

2. Consider the following problem.

$$\text{Minimize } Z = 3x_1 + 2x_2$$

subject to

$$2x_1 + x_2 \geq 10$$

$$-3x_1 + 2x_2 \leq 6$$

$$x_1 + x_2 \geq 6$$

$$\text{and } x_1 \geq 0, x_2 \geq 0.$$

Using the Big M method, construct the complete first simplex tableau for the simplex method and identify the corresponding initial (artificial) basic feasible solution. Also identify the initial entering basic variable and the leaving basic variable. Work through the simplex method step by step to solve the problem.

3. During the noon time (12:00-13:00Pm), customers arriving at the copy shop follow exponential distribution with a mean of 30 people per hour. Only one copying machine is available to serve customers. The service time for each customer follows exponential distribution with a mean of 1.2 minute. In a steady state, calculate (1) the expected number of customers in queue, (2) the expected waiting time in system, (3) the probability of n customers in the system, while $n=0,1,2,3,4$ and $n \geq 5$. (第 1 小題 5%，第 2 小題 5%，第 3 小題 10%)

4. Consider the following nonlinear programming problem.

$$\text{Maximize } 2x^3 + 8y^2 + 32z^3$$

$$\text{Subject to } x \cdot y \cdot z = 4$$

$$\text{and } x \geq 1, y \geq 1, z \geq 1$$

Solve by dynamic programming when variables x, y and z are required to be integer.

5. Describe the following Primal-Dual Relationships:

- (1) Weak duality property 6%
- (2) Strong duality property 7%
- (3) Complementary solutions property 7%