

國立臺灣科技大學
九十四學年度碩士班招生考試試題

系所組別：工業管理系碩士班甲組
科 目：作業研究

注意事項：

1. 本試題共【5】題，配分共100分。每題計分列舉於題目后。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。Show all your calculations。

1. (15分) Use the big M simplex method to solve:

$$\text{Minimize: } Z = 6x_1 + 3x_2 + 4x_3$$

Subject to:

$$x_1 \geq 30$$

$$x_2 \leq 50$$

$$x_3 \geq 20$$

$$x_1 + x_2 + x_3 = 120$$

$$x_1, x_2, x_3 \geq 0$$

2. (15分) A batch of four jobs can be assigned to five different machines. The setup time for each job on various machines is given by the following table:

		Machine				
		1	2	3	4	5
Job	1	10	11	4	2	8
	2	7	11	10	14	12
	3	5	6	9	12	14
	4	13	15	11	10	7

Find an optimal assignment of jobs to machines which will minimize the total setup time.

3. (20分) Consider the symmetric primal-dual linear programs, $\max Z = \mathbf{c}\mathbf{x}$, $\mathbf{A}\mathbf{x} \leq \mathbf{b}$, $\mathbf{x} \geq \mathbf{0}$, and $\min W = \mathbf{y}\mathbf{b}$, $\mathbf{y}\mathbf{A} \geq \mathbf{c}$, $\mathbf{y} \geq \mathbf{0}$. The value of the objective function of the minimum problem (dual) for any feasible solution is always greater than or equal to that of the maximum problem (primal).
- 1). What is the theorem's name? Please proof it. (10分)
 - 2). From this theorem, please infer the important results. (10分)
4. (25分) An insurance company charges a customer according to his or her accident history. A customer who has had no accident during last two years is charged a \$100 annual premium. Any customer who has had an accident during each of last two years is charged a \$400 annual premium. A customer who has had an accident during only one of the last two years is charged an annual premium of \$300. A customer who has had an accident during last year has a 10% chance of having an accident during current year. If a customer has not had an accident during last year, there is only a 3% chance that he or she will have an accident during current year. Set up a four-state Markov chain and calculate the average premium paid by a customer of this insurance company during a given year.
5. (25分) Consider a one-server queueing system in which the arrival and service rates are given by

$$\lambda_n = 10 - n, n = 0, 1, 2, 3$$

$$\mu_n = \frac{n}{2} + 5, n = 1, 2, 3, 4$$

- (a) Set up the rate diagram and determine the balance equations for the system (10分).
- (b) Determine the steady-state probabilities (15分).

