

國立臺灣科技大學

114學年度碩士班招生

試題

系所組別：0110工業管理系碩士班甲組

科目：作業研究

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(總分為 100 分；所有試題務必於答案卷內頁依序作答)

1. (25%) Use the **two-phase method** to solve the following problem.

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

subject to

$$5x_1 + 3x_2 + 3x_3 \geq 12$$

$$3x_1 + x_2 + 2x_3 = 6$$

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

2. (25%) Use the **branch-and-bound** algorithm to solve the following problem.

$$\text{Maximize } Z = 8x_1 - 2x_2 - 4x_3 + 5x_4 + 5x_5$$

subject to

$$x_2 + 3x_3 - x_4 - 2x_5 \geq 0$$

$$-7x_1 + 9x_2 + 9x_3 - 3x_4 + 6x_5 \geq 10$$

$$x_j \text{ is binary, for } j = 1, 2, 3, 4, 5.$$

3. (15 %) If a company charges a price p for a product and spends $\$a$ on advertising, it can sell $(10,000 + 5\sqrt{a} - 100p)$ units of the product. If the product costs $\$10$ per unit to produce, then how can the company maximize profits?
4. (15%) Three out of every four trucks on the road are followed by a car, while only one out of every five cars is followed by a truck. What fraction of vehicles on the road are trucks?
5. (20%) NTUST is planning to open a small car-wash operation for washing just one car at a time. NTUST must decide how much space to provide for waiting cars. NTUST estimates that customers arrive randomly (a Poisson input process) with a mean rate of 1 every 4 minutes, unless the waiting area is full, in which case the arriving customers will turn away immediately. The time that can be attributed to washing one car has an exponential distribution with a mean of 3 minutes. Compare the expected fraction of potential customers that will be *lost* because of inadequate waiting space if 0 and 2 spaces were provided.

