

國立臺灣科技大學
八十七學年度碩士班招生考試試題

所 別：管理技術研究所
學程別：工業管理學程

組別：

科目：作業研究

1. For the following problem, find three alternative optimal basic solutions, and then write a general expression for all the nonbasic alternative optimal solution constituting these three basic solutions (25%):

$$\begin{aligned} \text{Maximize } z &= x_1 + 2x_2 + 3x_3 \\ \text{subject to } & x_1 + 2x_2 + 3x_3 \leq 10 \\ & x_1 + x_2 \leq 5 \\ & x_1 \leq 1 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

2. The following tableau gives an optimal solution to a standard linear programming problem: maximize $z = cx$, subject to $Ax = b$, $x \geq 0$.

c_j	2	3	1	0	0	
Basis	x_1	x_2	x_3	x_4	x_5	rhs
x_1	1	0	1	3	-1	1
x_2	0	1	1	-1	2	2
$\bar{c}$ row	0	0	-4	-3	-4	$z = 8$

Assume (x_4, x_5) was the initial basic variables.

- (a) How much can c_3 be increased before the current basis is no longer optimal?

Find an optimal solution when $c_3 = 6$ (6%).

- (b) Find the largest and the smallest value of λ for which the given solution is still optimal if c is replaced by $c + \lambda c'$ where $c' = (0, 0, 1, -1, 2)$ and $-\infty \leq \lambda \leq \infty$ (7%).

- (c) How much can b_2 (the original value) be varied before the given basis (x_1, x_2) is no longer feasible (6%)?

- (d) Find an optimal solution by the dual simplex method when b_2 is increased by 2 (6%).

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3. Consider a single-server queue model where only one customer is allowed in the system. Customers who arrive and find the server busy never return. Assume that arrivals occur according to a Poisson distribution with mean λ per unit time and that the service time is exponential with mean $1/\mu$ time units.
- (a) Set up the rate diagram and write down the balance equations (7%).
- (b) Find the steady-state probabilities (10%).
- (c) What is the average number of customers in the system (8%)?
4. A machine is used to produce precision tools. If the machine is in good condition today, then 90% of the time it will be in good condition tomorrow. If the machine is in good condition, it produces 100 tools per day. If the machine is in bad condition, it produces 60 tools per day. On the average, how many tools per day are produced (25%)?