淡江大學 100 學年度碩士班招生考試試題

93-1

系別：運輸管理學系　　科目：作　業　研　究

考試日期：2 月 28 日(星期一) 第 2 節　　本試題共 8 大題， 3 頁

本試題雙面印刷

1. Linear Programming: Sensitivity Analysis 敏感度分析 (15%)

$$\max \quad Z = 3x_1 + 2x_2 \qquad (profit)$$

s.t

$$4x_1 + 3x_2 \le 12 \qquad (resource1)$$
$$4x_1 + x_2 \le 8 \qquad (resource2)$$
$$4x_1 - x_2 \le 8 \qquad (resource3)$$
$$x_1, x_2 \ge 0$$

其 Optimal tableau 如下：

（a） 試說明各 resource 之狀態（status）。

（b） 試求各 resource 之單位價值（unit worth）。

（c） 試求在保持現有之 optimal solution 下，目標式（Z）中 x_1 之係數之範圍？

Basic	x_1	x_2	x_3	x_4	x_5	Solution
Z	0	0	5／8	1／8	0	17／2
x_2	0	1	1／2	-1／2	0	2
x_1	1	0	-1／8	3／8	0	3／2
x_5	0	0	1	-2	1	4

2. Primal-Dual Relationship (15%)

Consider the following problem:

$$\text{Max} \quad Z = 5x_1 + 2x_2 + 3x_3$$

s.t

$$x_1 + 5x_2 + 2x_3 \le b_1 \qquad (常數)$$
$$x_1 - 5x_2 - 6x_3 \le b_2 \qquad (常數)$$
$$x_1, x_2, x_3 \ge 0$$

若已知其 optimal tableau 如下表：

Basic	x_1	x_2	x_3	s_1	s_2	Solution
Z	0	a	7	d	e	150
x_1	1	b	2	1	0	30
s_2	0	c	-8	-1	1	10

（a） 求 b_1 及 b_2 值 (in the primal constraints)。

（b） 求 a、b、c、d 之值 (in the optimal tableau)。

背面尚有試題

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93-2

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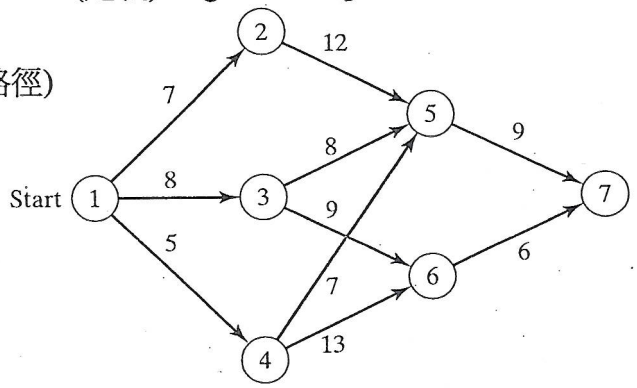
3. Dynamic Programming: Shortest Path (15%)

Please solve the following shortest path from node 1 to node 7 using Dynamic Programming.

(a) Draw a diagram (繪圖) to illustrate and define (定義) stages of this problem.

(b) Define the forward recursive equation.

(c) Determine the shortest path. (求出最短路徑)



4. Transportation Problem: Method of Multiplier (10%)

In a 3 * 3transportation problem, let X_{ij} be the amount shipped from source i to destination j and C_{ij} be the corresponding transportation cost per unit. The amount of supply at sources 1, 2 and 3 are 15, 30, and 85 units, respectively; and the demands at destination 1, 2, and 3 are 20, 30, and 80 units, respectively. Assume that the staring northwest-corner solution is optimal and the associated values of **multipliers** are given as $u_1 = -2$, $u_2 = 3$, $u_3 = 5$; and $v_1 = 2$, $v_2 = 5$, and $v_3 = 10$.

(a) Construct the transportation tableau.

(b) Find the associated optimal cost. (Hint: express the objective function first.)

(c) Determine the smallest value of C_{ij} associated with each *nonbasic* variable that will maintain the optimality of the northwest-corner solution.

5. Generalized Queuing Model (20%)

Visitors' parking at business school of Tamkang University is limited to five spaces only. Cars making use of this space arrive according to a Poisson distribution at the rate of six cars per hour. Parking time is exponentially distributed with a mean of 30 minutes. Visitors who can not find an empty space immediately on arrival may temporarily wait inside the parking lot until a parked car leaves. The temporary space can hold only three cars. Other cars that can not park or find a temporary waiting space must go elsewhere.

Determine the following:

(a) The probability of having n cars in the system.

(b) The effective arrival rate foe cars that actually use the parking lot.

(c) The average number of cars in the lot.

(d) The average time a car waits for a parking space inside the lot.

(e) The average number of occupied parking spaces.

(f) The average utilization of the parking lot.

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6. Project Management (5%)

For each of the following activities, determine the **maximum delay** in the starting time relative to its earliest start time that will allow all the immediately succeeding activities to be scheduled anywhere between their earliest and latest completion times. *(Note: TF: total float, FF: free float, D: duration)*

(a) $TF = 10, FF = 10, D = 4$

(b) $TF = 10, FF = 5, D = 4$

(c) $TF = 10, FF = 0, D = 4$

7. Bayes' Probabilities (10%)

MRT company receives 75% of its electronic components from vendor A and 25% from vendor B. The percentage of defective from vendor A and B are 1% and 2% respectively. When a random sample of size 5 taken from a recently received lot is inspected, only one item is found defective. Determine (a) the probability that the lot is received from vendor A, (b) the probability that the lot is received from vendor B.

8. Probabilistic EOQ Inventory Problem (10%)

The demand for an item during a single period occurs instantaneously at the start of the period. The associated probability density function is uniform between 10 and 15 units. Because of the difficulty in estimating the cost parameters, the order quantity is determined such that the probability of either surplus or shortage does not exceed 0.1.

(a) Express the condition of surplus constraint.

(b) Express the condition of shortage constraint.

(c) Is it possible to obtain an optimal ordering quantity to satisfy both constraints simultaneously?