

國立臺灣科技大學

九十一學年度碩士班招生考試試題

系所組別：工程技術研究所自動化及控制學程乙組

科目：作業研究

總分 100 分。Show all your calculations.

1. (a) Formulate a linear programming problem for finding a vector satisfying

$$4x_1 + x_2 \leq 5 \quad \text{and} \quad x_1 \geq 0, x_2 \geq 0$$

and having the maximum of

$$2x_1 - x_2 \quad \text{and} \quad -3x_1 + 2x_2$$

as small as possible (15points).

- (b) Find an optimal solution of the linear programming problem in (a) (15 points).

2. A company producing a certain product has three plants and four customers. Plants 1, 2, and 3 will produce 3000, 5000, and 5000 units, respectively, during the next time period. The company has made a commitment to sell 4000 units to customer 1, 3000 units to customer 2, and at least 3000 units to customer 3. Both customers 3 and 4 also want to buy as many of the remaining units as possible. The profit associated with shipping a unit from plant i to customer j is given in the following table. Formulate and solve as a transportation problem to maximize the company's profit (20 points).

From	To customer			
	1	2	3	4
Plant 1	\$65	\$63	\$62	\$64
Plant 2	\$68	\$67	\$65	\$62
Plant 3	\$63	\$60	\$59	\$60

3. Given the following transition matrix with states 1 and 2 as absorbing states, what is the probability that units in states 3 and 4 end up in each of the absorbing states (20 points)?

$$P = \begin{bmatrix} 1.0 & 0.0 & 0.0 & 0.0 \\ 0.0 & 1.0 & 0.0 & 0.0 \\ 0.2 & 0.1 & 0.4 & 0.3 \\ 0.2 & 0.2 & 0.1 & 0.5 \end{bmatrix}$$



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4. The Dynaco Manufacturing Company has an assembly line that feeds two drill presses. As partially completed products come off the line, they are lined up to be worked on as drill presses become available. The units arrive at the workstation (containing both presses) at the rate of 100 per hour. Each press operator can process an average of 60 units per hour.
- (a) Determine the average number of parts waiting to be worked on this workstation and the average waiting time (15 points).
- (b) The company has found that if more than three units (average) are waiting to be processed at any one workstation, then too much money is being tied up in in-process inventory. The company estimates that (on the average) each unit waiting to be processed costs \$50 per day. Alternatively, operating a third press would cost \$150 per day. Should the company operate a third press at this workstation (15 points)?

