

國立臺灣科技大學  
九十三學年度碩士班考試試題

系所組別：工業管理系甲組  
科 目：作業研究

總分 100 分。 Show all your calculations. Each problem is 25 points.

- An electronic firm has a contract to deliver the following number of radios during the next three months: month 1, 200 radios; month 2, 300 radios; month 3, 300 radios. For each radio produced during months 1 and 2, a \$10 variable cost is incurred; for each radio produced during month 3, a \$12 variable cost is incurred. The inventory cost is \$1.50 for each radio in stock at the end of a month. The cost of setting up for production during a month is \$250. Radios made during a month may be used to meet demand for that month or any future month. Assume that production during each month must be a multiple of 100. Given that the initial inventory level is zero, use dynamic programming to determine an optimal production procedure.
- Consider the following linear programming problem and its optimal tableau:

$$\begin{aligned} \text{Maximize } Z &= c_1x_1 + c_2x_2 \\ \text{subject to } & a_{11}x_1 + a_{12}x_2 \leq b_1 \\ & a_{21}x_1 + a_{22}x_2 \leq b_2 \\ & x_1, x_2 \geq 0 \end{aligned}$$

Basis \ $x_j$	Z	$x_1$	$x_2$	$s_1$	$s_2$	RHS
Z	1	0	0	-2	-3	5/2
$x_1$	0	1	0	3	2	5/2
$x_2$	0	0	1	1	1	1

Determine  $c_1, c_2, b_1, b_2, a_{11}, a_{12}, a_{21},$  and  $a_{22}$ .

- The manager of a large group of employees must decide if she needs another photocopying machine. The cost of renting a machine is \$40 per 8-hour day whether or not the machine is in use. An average of 4 people per hour need to use the copying machine. Each person uses the copying machine for an average of 10 minutes. Interarrival times and copying times are exponentially distributed. Employees are paid \$8 per hour, and assume that a waiting cost is incurred when a worker is waiting in line or is using the copying machine. How many copying machines should be rented?



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4. Customers buy cars from three auto companies. Given the company from which a customer last bought a car, the probability that he/she will buy next car from each company is as follows:

Last bought from	Will buy next from		
	Co. 1	Co. 2	Co. 3
Co. 1	.80	.10	.10
Co. 2	.05	.85	.10
Co. 3	.10	.20	.70

- a. If someone currently owns a company 1 car, what is the probability that at least one of the next two cars he/she buys will be a company 1 car (10 points)?
- b. At present, it costs company 1 an average of \$5,000 to produce a car, and the average price a customer pays for a company 1 car is \$8,000. Company 1 is considering instituting a five-year warranty. It estimates that this will increase the cost per car by \$300, but a market research survey indicates that the probabilities will change as follows:

Last bought from	Will buy next from		
	Co. 1	Co. 2	Co. 3
Co. 1	.85	.10	.05
Co. 2	.10	.80	.10
Co. 3	.15	.10	.75

Should company 1 institute the five-year warranty (15 points)?

