

The Open University of Sri Lanka
Faculty of Engineering Technology



Study Programme	:	BACHELOR OF INDUSTRIAL STUDIES
Name of the Examination	:	Final Examination
Course Code and Title	:	MEX4241– OPERATIONAL DECISION MAKING
Academic Year	:	2012/13
Date	:	24th August 2013
Time	:	0930hours –1230hours
Duration	:	3 hours

General instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of 8 questions. All questions carry equal marks.
3. Answer any 5 questions only.

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1. A black die and a white die are thrown together once;
 - a. Write down the sample space for the experiment
 - b. Find the probability of getting the sum of values on the two faces shown is greater than 9 or equal to 6.
 - c. Find the probability of getting the difference in values on the two faces shown exactly equal to 2.
 2. The probability that a vehicle departs from the point X on time is 0.81 and the probability that the same vehicle arrives at the point Y on time is 0.90. The probability that it departs and arrives on time is 0.72. Find the probability that the vehicle;
 - a. Arrives on time given that it departed on time.
 - b. Departed on time given that it has arrived on time.
 3. Express Baye's theorem in its usual notations. A company uses two similar equipment A and B. Equipment A produces 30% of items with a 4% defective rate. Equipment B produces 70% of items with a 2% defective rate. Find the probability that a defective item is produced by the equipment A and equipment B respectively.

4. A certain factory has 2000 items in the stores. The shelf life of the items is normally distributed with a mean shelf life of 900 hours with a standard deviation of 150 hrs. How many items will fail within the first 600 hrs? (Normal Distribution Table is Given)

5. Show on a rough graph the feasible region for the following set of inequalities;

$$3X + 4Y \leq 48$$

$$2Y \geq X$$

$$X > 5$$

$$X \geq 0$$

$$Y \geq 0$$

6. ABC Company produces two different products P1 and P2. The demand for both is good and per unit profit contribution is Rs 40 on P1 and Rs 50 on P2. Resources requirement of each product is as follows;

	P1	P2
Labour Hours	2	3
Machine Hours	5	3

During the next month, only 7000 labour hours and 13,000 machine hours are available for production. Now the company wants to maximize total profit contribution.

- Formulate the linear programming model.
 - Find out the optimal solution.
7. A company has an annual demand of 25,000 units per year. Every time the company places an order to the manufacturer, there is a fixed charge of Rs 1500 independent of the type of the order. It costs Rs 3 to hold an item in the inventory for a year. Find the followings;
- Economic order quantity.
 - Optimal number of orders per year.
 - Optimal time between orders.
8. An automobile service station has a mean arrival rate of 5 cars per day and a mean service rate of 6 cars per day.
- What is the utilization factor for the service station?
 - What is the probability that the service station will be empty?
 - What is the average time a unit spends in the system?

Use the Hints as follows;

$P_0 = [1 - \lambda/\mu]$ Probability that the system is idle

$P_n = (\lambda/\mu)^n P_0$ where n is the number in the queuing system

$L = \lambda/(\mu - \lambda)$ Average number of units in the system

$W = 1/(\mu - \lambda)$ Average time a unit spends in the system

$L_q = \lambda^2/\mu(\mu - \lambda)$ Average number of units in the queue

$W_q = \lambda/\mu(\mu - \lambda)$ Average time a unit spends in the queue

$P_q = \lambda/\mu$ Probability that an arriving unit has to wait for services

Where λ is arrival rate per unit time and μ is service rate per unit time

END

