THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
BACHELOR OF INDUSTRIAL STUDIES
FINAL EXAMINATION 2010/2011

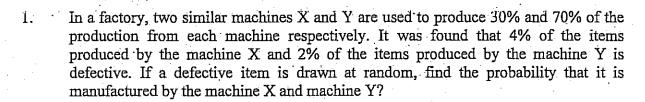**MEX4241– OPERATIONAL DECISION MAKING**
DATE : 05th March 2011
TIME : 0930hours – 1230hours
DURATION : 03 Hours

INSTRUCTIONS:

- **Answer any five (05) questions.**

- **All questions carry equal marks.**

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1. In a factory, two similar machines X and Y are used to produce 30% and 70% of the production from each machine respectively. It was found that 4% of the items produced by the machine X and 2% of the items produced by the machine Y is defective. If a defective item is drawn at random, find the probability that it is manufactured by the machine X and machine Y?

2. A company makes two products X and Y and each product must be processed on two machines M1 and M2. The total machine time available weekly on each machine is 100 hours. The company can earn a profit of Rs 40 per unit on X and Rs 30 per unit on Y. Product X requires 01 hour of machine time on M1 and 03 hrs of machine time on M2. Product Y requires 02 hrs on M1 and 01 hr on M2.

   A. Formulate this production problem as a linear programming model.
   B. Solve graphically the quantities of X and Y that should be produced for the maximum profitability.
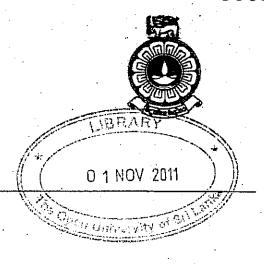   C. Find the maximum profit.

3. Solve using the Simplex Method.

   Maximize $Z = 3X + 2Y$

   Subject to: $4X + Y \leq 200$
   $X + Y \leq 80$
   $X + 3Y \leq 180$
   $X, Y \geq 0$

4. Consider the following transportation problem and use the North-West corner rule to find an initial solution. Use the stepping stone method to find an optimal solution.

	D1	D2	D3	Supply
Q1	4	3	8	200
Q2	3	2	5	200
Q3	7	9	3	400
Demand	350	300	150	

Demand and supply are in Kilograms while the values in the cages show the price in Rs per unit weight for transportation.

5. A discreet random variable X has the following probability distribution.

X	0	1	2	3	4	5	6	7
P(X)	k	2k	3k	5k	6k	7k	12k	16k

A. Determine the value of k
B. Find P $(X < 3)$, P$(X \geq 3)$, P$(0 < X < 6)$
C. Find smallest value of X for which P $(X \leq x) > 0.5$

6. The lifetime of a particular bulb is normally distributed with a mean of 3000 hrs and a standard deviation of 200 hrs. Find the probability that one of these bulbs will last;
A. Between 3000 hrs to 3500 hrs
B. Between 2600 hrs to 3500 hrs
C. More than 2500 hrs.

7. Given the following annual demand, annual cost per order and carrying cost. Compute the economic order quantity, the total annual minimum cost and the length of the inventory cycle.
Demand (D) = 140,000 units
Cost per order (k) = Rs 2100
Carrying cost (h) = Rs 3

8. A single channel queuing system has a mean arrival rate of 12 customers per hour. The service rate is 18 customers per hour.
A. Find the probability that the service facility will be idleing.
B. Find the probability that there will be at least one customer waiting to be served.
C. Find the average number of customers in the system.

Assume the symbols μ as the mean service rate and λ as the mean arrival rate with the usual symbols in the standard equation.