

R09

Code No: 09A70301

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, May/June - 2013

Operations Research

(Common to ME, MCT, AME)

Time: 3 Hours

Max. Marks: 75

**Answer any Five Questions
All Questions Carry Equal Marks**

1. Solve the following LPP problem by two-phase method

$$\text{Max} = 2x_1 + 3x_2 + 5x_3 \quad \text{S.T}$$

$$3x_1 + 10x_2 + 5x_3 \leq 15$$

$$33x_1 - 10x_2 + 9x_3 \leq 33$$

$$x_1 + 2x_2 + 3x_3 \geq 4$$

$$x_1, x_2, x_3 \geq 0$$

[15]

2.a) Give the mathematical formulation of transportation problem.

b) Use Vogel's' approximate method to obtain an initial basic feasible solution of the transportation problem & find the optimal solution. D [15]

Warehouse	W	X	Y	Z	Supply
Factory					
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

3.a) State the group replacement policy

b) The following failure rates have been observed for a certain type of light bulbs:

End of week	Probability of failure to date
1	0.05
2	0.13
3	0.25
4	0.43
5	0.68
6	0.88
7	0.96
8	1.00

The cost of replacing an individual failed bulb is Rs.1.25. The decision is made to replace all bulbs simultaneously at fixed intervals and also to replace individual bulbs as they fall in service. If the cost of group replacement is 30 paise per bulb, what is the best interval between group replacement? At what group replacement price per bulb would a policy of strictly individual replacement become preferable to the adopted policy? [15]

- 4.a) Explain the terms i) rectangular games. ii) types of strategies.
 b) Solve the following game graphically where pay off matrix for player A has been prepared. [15]

1	5	-7	4	2
2	4	9	-3	1

5. Patients arrive at a clinic to a Poisson distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. The examination time per patient is exponential with mean rate of 20 per hour.
 a) Find the effective arrival rate at the clinic?
 b) What is the probability that an arriving patient will not wait?
 c) What is the expected waiting time until a patient is discharged from the clinic? [15]
- 6.a) Derive the optimal policy for probabilistic single period inventory models.
 b) The probability distribution of monthly sale of a certain item is as follows:

Monthly sales	0	1	2	3	4	5	6
Probability	0.01	0.06	0.25	0.35	0.20	0.03	0.10

- The cost of carrying inventory is Rs.30 per unit per month and the cost of unit shortage is Rs.70 per month. Determine the optimum stock level that minimizes the total expected cost. [15]
7. Solve the following LPP by using Dynamic Programming

$$\text{Max } z = 15x_1 + 10x_2$$

$$\text{st } x_1 + 2x_2 \leq 6 \quad 3x_1 + x_2 \leq 8 \quad x_1, x_2 \geq 0$$
 [15]
8. Customer arrives randomly at a bus reservation counter from 2 to 5 minutes apart, with equal probability of occurrence. The ticket issuance time (service time) varies from 3 to 6 minutes, with following probabilities.

Service Time (minutes)	3	4	5	6
Probability	0.2	0.3	0.35	0.15

- The distribution of service time has been reconstructed from past records as follows: Simulate the system for 5 customers. Determine the following (i) % utilization of ticketing clerk (ii) Average time spent by the customers in the system.
 Random digits for inter arrival time: 30, 59, 48, 00, 35, 12, 03, 57
 Random digits for service time : 73, 07, 14, 19, 55, 90, 57, 60 [15]

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