7E7013

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7E7013

B. Tech. VII Sem. (Main/Back) Exam., Nov.-Dec.-2016

Mechanical Engineering

7ME3A Operations Research

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks Main : 26

Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

1. NIL

2. NIL

UNIT – I

Q.1 Maximize $Z = 2x_1 + 4x_2 + x_3 + x_4$

Subject to $x_1 + 3x_2 + x_4 \leq 4$

$2x_1 + x_2 \leq 3$

$x_2 + x_3 + x_4 \leq 3$

$x_1, x_2, x_3, x_4 \geq 0$ **[16]**

OR

Q.1 (a) Solve the following transportation problem by:

(i) Minimum cost method

(ii) NWC method

State which of the methods is better. Cell entries represent the unit transportation cost: **[8]**

	D_1	D_2	D_3	D_4	Availability
S_1	21	16	25	13	11
S_2	17	18	14	23	13
S_3	32	27	18	41	19
Requirement	6	10	12	15	

(b) Find an optimal solution to an assignment problem with the following cost matrix. [8]

	J_1	J_2	J_3	J_4
M_1	10	9	7	8
M_2	5	8	7	7
M_3	5	4	6	5
M_4	2	3	4	5

UNIT – II

Q.2 Solve the following integer problem by branch and bound technique using graphical method. Show the mode branch tree.

Max $Z = 21x_1 + 11x_2$

Subject to $7x_1 + 4x_2 \leq 13$

$x_1, x_2 \geq 0$ and integer [16]

OR

Q.2 A manufacturer is offered two machines A and B. A is priced at ₹ 500 and running costs are estimated at ₹ 800 for each of the first five years, increasing by ₹ 200 per year in the sixth and subsequent years. Machine B is having cost of ₹ 1200 per year for six year increasing by ₹ 200 per year thereafter. If the time value of money is 10% per year which machine should be purchased? [16]

UNIT – III

Q.3 Arrival rate of telephone calls at a telephone booth are according to Poission Distribution with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed with mean 3 minutes.

(a) Determine the probability that a person arriving at the booth will have to wait. [2]

(b) Find the average queue length that is formed from time to time. [2]

(c) Telephone Company will install a second booth when convinced that an arrival would except to have to wait at least 4 minutes for the phone. Find the increase in flow of arrivals which will justify a second booth. [3]

(d) What is probability that an arrival will have to wait for more than 10 minutes before the phone is free? [3]

(e) What is the probability that he will have to wait for more than 10 minutes before the phone is available and the call is also complete? [3]

(f) Find the fraction of the day that the phone will be in use. [3]

OR

Q.3 (a) Determine optimum and value of the game for the following pay-off matrix. **[8]**

		Y		
		R	S	T
X	P	200	-10	-100
	Q	100	110	130

(b) Use the relation of dominance to solve the rectangular game whose payoff matrix is given below: **[8]**

	I	II	III	IV	V	VI
I	0	0	0	0	0	0
II	4	2	0	2	1	1
III	4	3	1	3	2	2
IV	4	3	7	-5	1	2
V	4	3	4	-1	2	2
VI	4	3	3	-2	2	2

UNIT – IV

Q.4 (a) Write short notes on Decision Trees. **[8]**

(b) A manufacturing company purchases 9,000 parts of machine for its annual requirements, ordering one month use at a time. Each part costs ₹ 20. The ordering cost per order is ₹ 15 and the carrying charges are 15% of the average inventory per year. Suggest a more economical purchasing policy for the company. How much would it be possible for the company to save per year? **[8]**

OR

Q.4 (a) Write short note on Deterministic Inventory Model. **[8]**

(b) The data given below pertains to a component used by Engineering India (P) Ltd. in 20 different assemblies.

Purchase price (P) = ₹ 15 per 100 units,
Annual usage = 1,00,000 units,
Cost of buying office = ₹ 15,575 per annum (Fixed),
Variable cost = ₹ 12 per order,
Rent of component = ₹ 3,000 per annum,
Heating cost = ₹ 700 per annum,
Interest = ₹ 25 per annum,
Insurance = 0.05% per annum based on total purchase,
Depreciation = 1% per annum of all items purchased

(i) Calculate EOQ of the component.

(ii) The percentage changes in total annual variable costs relating to component if the annual uses happens to be (a) 1,25,000 & (b) 75,000. **[8]**

UNIT – V

Q.5 (a) A newspaper boy buys for 0.05 paise each and sells them for 0.06 paise each. He cannot return unsold newspapers. Daily demand 'r' for newspapers follows the distribution:

Demand 'r'	10	11	12	13	14	15	16
Probability P (r)	0.05	0.15	0.40	0.20	0.10	0.05	0.05

If each days demand is independent of the previous days demand, how many papers should be ordered each day? **[8]**

(b) What is the need of simulation? Also discuss the advantages and disadvantages of simulation methods. **[8]**

OR

Q.5 (a) The demand for a particular product is continuous and shows the following probability distribution.

Demand	0	1	2	3	4	5 or more
Probability	0.16	0.10	0.30	0.24	0.20	0.00

Find out the optimum stock level if the cost of shortage is ₹ 40 per unit and the cost of holding is ₹ 10 per unit. The shortage cost is proportional to both time and quantity short. **[8]**

(b) Write short note on Monte – Carlo method of simulation. **[8]**
