

7E7013

Roll No. _____

Total No of Pages: **4****7E7013****B. Tech. VII Sem. (Main / Back) Exam., Nov. – Dec. - 2018****Mechanical Engineering
7ME3A Operations Research****Time: 3 Hours****Maximum Marks: 80****Min. Passing Marks: 26***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.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL2. NIL**UNIT- I**

Q.1 (a) Solve the following linear programming by Simplex method [8]

$$\text{Maximize } z = 2x_1 + 7x_2 + 2x_3$$

$$\text{Subject to } 2x_1 + x_2 + 4x_3 \leq 7$$

$$2x_1 + 3x_2 + 3x_3 \leq 12$$

(b) Solve the following transportation problem by Vogel's method: [8]

		Destinations				
		A ₁	A ₂	A ₃	A ₄	Supply
Sources	I	3	1	7	4	300
	II	2	6	5	9	400
	III	8	3	3	2	500
	Demand	250	350	400	200	

OR

- Q.1 A 'XYZ' Company have two bottling plants, one located at P_1 and the other at P_2 . Each plant produces three drinks 'A', 'B' and 'C'. The number of bottles produced per day are as follows - [16]

Drink	Plant P_1	Plant P_2
Drink A	1500	1500
Drink B	3000	1000
Drink C	2000	5000

The market survey indicated that during the month of April there will be a demand of 20,000 bottles of drink 'A', 40,000 bottles of drink 'B' and 44,000 bottles of drink 'C'. The operating costs per day of plants at P_1 and P_2 are 600 and 400 monetary units. For how many days should each plant be running in April so as to minimize the production cost, while still meeting the market demand? Solve by two – phase Simplex method.

UNIT- II

- 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 sixth year increasing by ₹ 200 per year thereafter. If the time value of money is 10% per year, which machine should be purchased? [16]

OR

- Q.2 Solve the following Integer Linear programming using Gomory's Cutting plane method: [16]

$$\text{Max } z = 2x_1 + 3x_2$$

$$\text{Subject to } 2x_1 + 2x_2 \leq 7,$$

$$x_1 \leq 2,$$

$$x_2 \leq 2,$$

$$x_1, x_2 \geq 0 \text{ and are integers}$$

UNIT- III

- Q.3 On an average 96 patients per (24 hours) day require the service of an emergency clinic also, on an average, a patient requires 10 minutes of active attention. Assume that the facilities can handle only one emergency at a time. Suppose that it costs the clinic ₹ 100 per patient treated to obtain an average servicing time of 10 minutes and that each minute of decrease in this average time would cost ₹ 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from $1\frac{1}{3}$ patient to $\frac{1}{2}$ patient? [16]

OR

- Q.3 (a) Determine optimum strategy 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 pay-off 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) Explain deterministic and stochastic inventory models. [8]
(b) A manufacturing company purchases 8,000 parts of a machine for its annual requirements, ordering one month use at a time. Each part costs ₹15. The ordering cost per order is ₹10 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 notes on Decision Trees. [8]
(b) A particular item has a demand of 9,000 units/year. The cost of one procurement is ₹100 and the holding cost per unit is ₹2.20/year. The replacement is instantaneous and the cost of shortage is ₹5 per unit per year. [8]
Determine –
(a) The economic lot size.
(b) The number of orders per year.
(c) The time b/w orders.
(d) The total costs per year if the cost of one unit is ₹50.

UNIT- V

- Q.5 (a) Write short note on Monte-Carlo method of simulation. [8]
(b) Explain the application of simulation technique to the inventory problems. [8]

OR

- Q.5 (a) A bakery keeps stock of a popular brand of cake. As per previous experience shows that the daily demand pattern for the item associated with probability is given below- [8]

Daily Demand	:	-	0	10	20	30	40	50
Probability	:	-	0.10	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random nos. to simulate the demand for the next 10 days, also find out the average demand per day.

Random Nos. 25, 39, 65, 12, 73, 05, 49, 19, 89, 76

- (b) Find the value of p experimentally by simulation? [8]