PRN:		Course Code :	MET 2604

Third Year **B. Tech** Semester End Examination Winter 2024

Operations Research

000181

Day and Date: Thu 28 NOV 2024 Max Marks: **50**

Time : 02:00PM To 04:00PM Duration: **02** hrs

Instructions: All questions are compulsory.

			Marks	Bloom's Level	CO
Q.1		**Attempt any two from the following**			
	a)	Discuss "OR gives bad solution to problems which otherwise has worst solution."	06	3	1
	b)	A firm is engaged in producing two products. A and B. Each unit of product A requires 2 kg of raw material and 4 labour hours for processing, where as each unit of B requires 3 kg of raw materials and 3 labour hours for the same type. Every week, the firm has an availability of 60 kg of raw material and 96 labour hours. One unit of product A sold yields Rs.40 and one unit of product B sold gives Rs.35 as profit. Formulate this as a Linear Programming Problem to determine as to how many units of each of the products should be produced per week so that the firm can earn maximum profit	06	3	1
	c)	A farmer is going to plant apples and bananas this year. It costs Rs 4000 per acre to plant apples and Rs 6000 per acre to plant bananas and the farmer has a maximum of Rs 740000 available for planting. To plant apples trees requires 20 labor hours per acre; to plant banana trees requires 25 labor hours. Suppose the farmer has a total of 3300 labor hours available. If he expects to make a profit of Rs 150000 per acre on apples and Rs 200000 per acre on bananas, how many acres each of apples and bananas should he cultivate? Formulate the problem as LPP	06	3	1
Q.2		**Attempt any two from the following**			
	a)	What do you mean by infeasibility and multiple optimal solution in linear programming ? Illustrate graphically.	06	3	2
	b)	Use Graphical Method to solve the following LPP Maximize $Z = 3X_1 + 4X_2$ Subject to constraints, $8X_1 + 12X_2 \leq 600$ $6X_1 + 5X_2 \leq 480$ $X_1 \geq 0$ $X_2 \geq 0$	06	3	2
	c)	Solve the following LPP Minimize $Z = 6X_1 + 2X_2$ Subject to constraints, $5X_1 + 6X_2 \geq 240$ $4X_1 + 7X_2 \geq 280$ $X_1 \geq 0$ $X_2 \geq 0$	06	3	2

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Q.3 **Attempt the following**

a) A construction company has four large bulldozers located at four different garages. The bulldozers are to be moved to four different construction sites. The distances in miles between the bulldozers and the construction sites are given below. 06 3 3

Bulldozer\Site	A	B	C	D
1	90	75	75	80
2	35	85	55	65
3	125	95	90	105
4	45	110	95	115

How should the bulldozers be moved to the construction sites in order to minimize the total distance traveled?

b) Determine Initial Basic Feasible solution to the following transportation problem using 07 3 3

i) Northwest Corner Rule Method
ii) Least Cost Method

Factory	Transportation cost in Rs per Unit					SUPPLY
	Destination					
	D1	D2	D3	D4	D5	
S1	3	4	6	8	9	20
S2	2	10	1	5	8	30
S3	7	11	20	40	3	15
S4	2	1	9	14	16	13
DEMAND	40	6	8	18	6	

OR

b) Find an optimal solution to the following transportation problem 07 3 3

Factory	Transportation cost in Rs per Unit					Supply
	Destination					
	A	B	C	D	E	
P	19	30	20	10	30	60
Q	70	30	10	60	30	35
R	40	8	20	20	50	40
Demand	22	45	20	18	30	

Q.4 **Attempt the following**

a) Explain in brief different methods used for decision making under risk. 06 3 4

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b) Dr. Thomas has been thinking about starting his own independent nursing home. The problem is to decide how large the nursing home should be. The annual returns will depend on both the size of nursing home and a number of marketing factors. After a careful analysis, Dr. Thomas developed the following table indicating annual return for different sizes of nursing home: 07 3 4

Size of nursing home	Good market	Fair Market	Poor Market
Small	50,000	40,000	10,000
Medium	70,000	35,000	25,000
Large	90,000	55,000	45,000
Very Large	2,00,000	25,000	20,000

What will be your decision under the following approach

i) Maximax
ii) Maximin
iii) Laplace Criterion

OR

b) A well-known department store advertises female fashion garments from time to time in the Sunday press. Only one garment is advertised on each occasion. The statistical probability of demand at various levels after advertisement is as follows 07 3 4

Demand (No. of Garments)	Probability
30	0.15
40	0.20
50	0.35
60	0.25
70	0.05

The garment advertised to sell at Rs 35 cost Rs 15 to make and can be disposed of, if unsold, for Rs 10.

Calculate how many garments should be purchased by the stores in order to maximize gross profit after advertising using EMV criterion

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