PRN:		Course Code :	MET2604

Third Year **B. Tech** End Semester Examination Summer 2023

Operations Research

Day and Date: 30 MAY 2024 , Thu 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 the significance and scope of OR in modern management.	06	3	1
b)	A company sells two different products A and B. The company makes a profit of Rs 40 and Rs 30 per unit respectively on the two products. The products are produced by a common production process and are sold in two different markets. The production process has a capacity of 30,000 man-hours. It takes 3 hours to produce a unit of product A and 1 hour to produce a unit of product B. The market has been surveyed and company officials found out that the maximum units that can sold for product A and B are 8,000 and 12,000 respectively. Formulate the problem as a linear programming problem	06	3	1
c)	A firm manufactures two items. It purchases castings which are then machined, bored and polished. Castings for items A and B cost Rs 30 and Rs 40 respectively and are sold at *Rs* 60 and Rs100 each respectively. Capacity of each machine and time required for each product on these machines are given below.	06	3	1

	Time for each unit of product A in Minutes	Time for each unit of product B in minutes	Total Available time per day in minutes
Machining	5	4	400
Boring	8	5	380
Polishing	3	2	360

Formulate as a linear programming problem

Q.2	**Attempt any two from the following**			
a)	Why do some problems have multiple optimal feasible solutions? How such information is useful for decision-making? Explain	06	3	2
b)	Use Graphical Method to solve the following LPP Maximize $Z = 5X_1 + 3X_2$ Subject to constraints, $3X_1 + 5X_2 \leq 15$ $5X_1 + 2X_2 \leq 10$ $X_1 \geq 0$ $X_2 \geq 0$	06	3	2
c)	Solve the following LPP	06	3	2

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Minimize $Z = 60 X_1 + 40 X_2$

Subject to constraints,

$$30 X_1 + 10X_2 \geq 240$$
$$10 X_1 + 10X_2 \geq 160$$
$$20 X_1 + 60X_2 \geq 480$$
$$X_1 \geq 0$$
$$X_2 \geq 0$$

Q.3 **Attempt the following**

a) Using the following cost matrix, determine optimal job assignment and associated cost. 06 3 3

Also find total cost in completing these jobs.

		Jobs				
		1	2	3	4	5
Workers	A	10	3	3	2	8
	B	9	7	8	2	7
	C	7	5	6	2	4
	D	3	5	8	2	4
	E	9	10	9	6	10

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

i) Northwest Corner Rule Method

ii) Least Cost Method

		Transportation cost in Rs per Unit				Supply
		Destination				
		W_1	W_2	W_3	W_4	
Factory	F_1	19	30	50	10	7
	F_3	70	30	40	60	9
	F_3	40	8	70	20	18
	Demand	5	8	7	14	

OR

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

Transportation cost in Rs per Unit

	Destination				Supply
	1	2	3	4	
A	7	3	8	6	60

Factory	B	4	2	5	10	100
	C	2	6	5	1	40
	Demand	20	50	50	80	

Q.4 **Attempt the following**

a) Explain clearly the following terms: 06 3 4
   i)Action space
   ii) State of nature
   iii) Payoff table

b) The following matrix gives the pay off of different strategies by Research Organization for variants of products S1, S2, S3 and S4 against different conditions of estimated levels of sales N1,N2 and N3 07 3 4

	N1	N2	N3
S1	30000	10000	10000
S2	40000	15000	5000
S3	55000	20000	3000

What will be your decision under the following approach
   i) Maximax
   ii) Maximin
   iii) Laplace Criterion

OR

b) A newspapers agent's experience shows that the daily demand of the newspapers in his area has the following probability distribution 07 3 4

Demand	300	400	500	600	700
Probability	0.1	0.3	0.4	0.1	0.1

He sells the newspaper for Rs 2 each and buys each at Rs 1. Unsold copies are traded as scrap and each copy fetches 10 paise. Assuming that he stocks the newspapers in multiples of 100 only, how many should he stock so as his expected profit is maximum?

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