

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA– SEMESTER –IV EXAMINATION –SUMMER-2019

Subject Code:640003

Date: 18-05-2019

Subject Name: Operations Research

Time:10.30 am to 1.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) What is LPP? Explain the basic components of an LP model and also state its assumptions. **07**

(b) What is Operations Research? Explain its application areas and features. **07**

Q.2 (a) A person wants to decide the constituents of a diet which will fulfill his daily requirements of Proteins, Fats and Vitamins at the minimum cost. The choice is to be made from four different types of foods. The yields per unit of these foods are given in the following table. Formulate linear programming model for the problem. **07**

Food Type	Yield Per Unit			Cost per Unit
	Proteins	Fats	Vitamins	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum Requirements	800	200	700	

(b) Solve the following LP problem using simplex method. **07**

Maximize $Z = 16x_1 + 17x_2 + 10x_3$

subject to the constraints

(i) $x_1 + x_2 + 4x_3 \leq 2000$ (ii) $2x_1 + x_2 + x_3 \leq 3600$ (iii) $x_1 + 2x_2 + 2x_3 \leq 2400$

(iv) $x_1 \leq 30$ and $x_1, x_2, x_3 \geq 0$

OR

(b) Solve the following LPPs through Big-M Method. **07**

Maximize: $Z = 2x_1 + 4x_2$

Subject to

i. $2x_1 + x_2 < 18$

ii. $3x_1 + 2x_2 > 30$

iii. $x_1 + 2x_2 = 26$ & $x_1, x_2 > 0$

Q.3 (a) Use the graphical method to solve the following LP problem. **07**

Minimize $Z = 3x_1 + 2x_2$

Subject to the constraints,

(i) $5x_1 + x_2 \geq 10$ (ii) $1x_1 + x_2 \geq 6$ (iii) $1x_1 + 4x_2 \geq 12$ and $x_1, x_2 \geq 0$

(b) Solve the following using LCM and VAM. **07**

	D1	D2	D3	D4	Supply
O1	21	16	25	13	11
O2	17	18	14	23	13
O3	32	27	18	41	19
Demand	6	10	12	15	

OR

- Q.3 (a)** Consider the job of assigning 5 jobs to 5 persons. The cost of which is given below: **07**

Jobs	Persons					
		A	B	C	D	E
	1	10	5	13	15	16
	2	3	9	18	13	6
	3	10	7	2	2	2
	4	7	11	9	7	12
	5	7	9	10	4	12

Determine the Optimum assignment Schedule and the minimum cost.

- (b)** The production department of a company requires 3600 kilogram of raw material for manufacturing a particular item per year. It has been satisfied that the cost of placing an order is Rs 36 and the cost of carrying inventory is 25 per cent of the investment in the inventories. The price is Rs 10 per kilogram. Help the purchase manager to determine an ordering policy for new material. **07**
- Q.4 (a)** A road transport company has one reservation clerk on duty at a time. He handles information of bus schedules and makes reservations. Customers arrive at a rate of 8 per hour and the clerk can, on an average, service 12 customer per hour. Answer the following: **07**
- (i) What is the average number of customers waiting for the service of the clerk?
 - (ii) What is the average time a customer has to wait before being served?
 - (iii) What is the probability of 3 customers waiting in the queue?
 - (iv) What is the expected number of customers in the queue?

- (b)** What is Simulation? Explain its advantages and disadvantages. **07**

OR

- Q.4 (a)** Find an optimal sequence for the following sequencing problems of four jobs and five machines, when passing is not allowed. Its processing time(in hours) is given below: **07**

Jobs	Machine					
		M1	M2	M3	M4	M5
	A	7	5	2	3	9
	B	6	6	4	5	10
	C	5	4	5	6	8
	D	8	3	3	2	6

Find the Total Elapsed Time and Idle time for each machine.

- (b)** Explain Errors and Dummies in network diagram. Also give the difference between PERT and CPM. **07**
- Q.5 (a)** Define: Pay-off Matrix, Sadle Point. Determine the best strategies for players A and B and the value of the game. Is this game (i) fair? (ii) for what value of λ will this game be strictly determinable? **07**

Player A	Player B		
	B1	B2	B3
A1	λ	6	2
A2	-1	λ	-7
A3	-2	4	Λ

- (b) The following maintenance job has to be performed periodically on the heat exchangers in a refinery: **07**

Task	A	B	C	D	E	F	G	H	I	J
Immediate Predecessor	--	A	B	B	B	C	C	F,G	D,E,H	I
Time(Days)	14	22	10	16	12	10	6	8	24	16

- Draw a network diagram of activities for the project.
- Identify the Critical Path. What is its Length?
- Find the total-float and free float for each non-critical activity.

OR

- Q.5** (a) Explain the following terms:

- Queue Discipline
- Types of Inventory

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- (b) The data collected in running a machine, the cost of which is Rs 60,000 are given below. Determine the optimum period for replacement of the machine. **07**

Year	1	2	3	4	5
Resale Value(Rs.)	42000	30000	20400	14400	9650
Cost of Spares(Rs.)	4000	4270	4880	5700	6800
Cost of labor)	14000	16000	18000	21000	25000
