GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2024

Subject Code:3151910 **Date:29-05-2024**
Subject Name:Operation Research
Time:02:30 PM TO 05:00 PM **Total Marks:70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Illustrate graphically for Linear Programming Problem; (a) No-feasible solution (b) Unbounded solution	**03**
	(b)	A company makes two products (A and B) and both require processing on 2 machines. Product A takes 10 and 15 minutes on the two machines per unit and product B takes 22 and 18 minutes per unit on the two machines. Both the machines are available for 2640 minutes per week. The products are sold for Rs 200 and Rs 175 respectively per unit. Formulate a LP to maximize revenue? The market can take a maximum of 150 units of product 1.	**04**
	(c)	What is linear programming problem? Discuss the scope and role of LPP in solving management problems.	**07**
Q.2	**(a)**	What are the assumptions in LPP?	**03**
	(b)	Solve following problem with graphical method.	**04**

Maximize $\quad Z = 3X_1 + 9X_2$
$\qquad$ Subject to $X_1 + 4X_2 \leq 8$,
$\qquad\qquad X_1 + 2X_2 \leq 4 \quad$ and $X_1, X_2 \geq 0$

(c) Solve the following problem using Big M method **07**
Maximize $\quad Z = 4X_1 + 5X_2$
$\qquad$ Subjects to $\quad 2X_1 + 3X_2 \leq 6$,
$\qquad\qquad 3X_1 + X_2 \geq 3, \qquad X_1, X_2 \geq 0.$

OR

(c) Using Simplex method solve the following LPP. **07**
$\qquad$ Maximize $Z = 5X_1 + 4X_2$
$\qquad$ Subject to $\quad X_1 - 2X_2 \leq 1$,
$\qquad\qquad X_1 + 2X_2 \geq 3 \quad$ and $\quad X_1, X_2 \geq 0$

Q.3	**(a)**	Briefly explain about unbalanced assignment problems.	**03**
	(b)	What are trans-shipment problems? Explain with suitable example.	**04**
	(c)	Solve the following transportation problem. Obtain the initial basic feasible solution by Vogel's method and optimal solution by MODI method.	**07**

	D1	D2	D3	D4	Supply
S1	3	2	4	1	20
S2	2	4	5	3	25
S3	4	3	1	4	15
S4	3	5	2	6	40
Demand	25	20	30	25	

OR

Q.3	**(a)**	Discuss various methods of getting IBFS in transportation problem.	**03**
	(b)	How will you define transportation problem? Give mathematical statement of problem explaining each term.	**04**

(c) Solve the following assignment problem for assigning jobs to workers. **07**

Workers		Jobs			
		A	B	C	D
	1	50	70	60	80
	2	80	50	70	100
	3	40	70	60	90
	4	100	40	30	110

Q.4 **(a)** Write down mathematical formula for game theory. **03**

(b) Explain the queuing model as indicated by the following notations. M/D/1 : FCFS/∞/∞ **04**

(c) Vehicles arrive at a toll-booth at a rate of 8 per minute. The serving capacity of operator at toll-booth is 10 vehicles per minute. Find out (i) utilization factor (ii) idle time for booth operator in an 8 hour shift (iii) number of vehicles waiting in the system (iv) number of persons waiting in the queue (v) average waiting time in the queue and (vi) total time spent by a vehicle in the system **07**

OR

Q.4 **(a)** Define the elements of Queuing system. **03**

(b) What are types of strategies for game theory? **04**

(c) As new automobile vehicle costs Rs. 10000 and it can be sold at the end of any year with the selling price as shown. The operating and maintenance cost are given year wise in following table. Find when the automobile vehicle needs to be replaced because of wear and tear. **07**

Year	1	2	3	4	5	6
Selling Price (Rs)	7000	6000	5000	3500	2500	1000
Operating & Maintenance Cost (Rs)	1000	1400	1600	2000	3000	3500

Q.5 **(a)** Explain Kendall's notation for queuing system. Also explain the terms: balking and jockeying **03**

(b) Describe some important replacement situations. **04**

(c) Solve the following 4 X 4 game using rule of dominance. **07**

Player A		Player B			
		1	2	3	4
	1	5	4	3	2
	2	6	2	5	4
	3	1	4	2	0
	4	3	5	3	2

OR

Q.5 **(a)** Differentiate between CPM and PERT **03**

(b) Explain various steps involved in decision making **04**

(c) A project schedule has the following characteristic: Construct a network diagram and find critical path, total duration of the project, various time estimates. **07**

Activity	Duration	Activity	Duration
1-2	3	4-8	6
1-4	2	5-6	5
1-7	1	6-9	4
2-3	3	7-8	4
3-6	2	8-9	5
4-5	4		

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