Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2021

Subject Code:3151910   **Date:20/09/2021**
Subject Name:Operation Research
Time:10:30 AM TO 01:00 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.

Q.1	**(a)**	Explain limitations of operation research.	**3**
	(b)	Explain advantages and limitations of linear programming.	**4**
	(c)	Explain stepwise procedure to solve linear programming problem with graphical method.	**7**
Q.2	**(a)**	Explain different phases of Operation research.	**3**
	(b)	Explain assumptions (properties) of linear programming.	**4**
	(c)	Solve the following problem by simplex method: Maximize $Z = 3x_1 + 2x_2$ Subject to constraints $2x_1 + x_2 \le 5$ $x_1 + x_2 \le 3$ and $x_1, x_2 \ge 0$.	**7**

OR

	(c)	Discuss various application areas of OR.	**7**
Q.3	**(a)**	What is degeneracy in transportation problem?	**3**
	(b)	The following table shows costs of transportation per unit product from plants to cities. Find the Initial basic feasible solution using Voggle's approximation method.	**4**

From/To	D	E	F	Supply
A	4	5	1	40
B	3	4	3	60
C	6	2	8	70
Demand	70	40	60	

(c) The captain of a cricket team has to allot five middle order batting positions to 5 batsmen available for selection. The average runs scored by each batsman at these positions are summarized in a table below. Using Assignment model, determine the assignment of batsmen to positions which would give maximum runs in favor of team. **7**

Batsman	Batting positions				
	I	II	III	IV	V
A	40	46	48	36	48
B	48	32	36	29	44
C	49	35	41	38	45
D	30	46	49	44	44
E	37	41	48	43	47

Q.3   **(a)**   Explain: Procedure for Group Replacement Theory   **3**
     (b)   Explain: (1) Saddle point (b) Limitations of a Game theory.   **4**
     (c)   Explain steps for decision theory approach.   **7**

Q.4   **(a)**   Define the following terms relating the customer's behavior in Queue. (A)Balking (B) Jockeying (C) Reneging   **3**
     (b)   Explain Kendall's notation for queuing system.   **4**
     (c)   In a bank counter, customers arrive at a rate of 30 customers per day. Assuming that the inter arrival time follows an exponential distribution and service time distribution is also exponential with an average of 36 minutes. Calculate:
Expected queue size
Probability that the queue size exceeds 10   **7**

OR

Q.4   **(a)**   What is "Strategy"? Explain the difference between pure strategy and mixed Strategy?   **3**
     (b)   Explain N-W corner method of transportation model   **4**
     (c)   Explain the steps of a Travelling Salesman Problem.   **7**

Q.5   **(a)**   What is replacement? Describe some important replacement situations.   **3**
     (b)   Explain forward and backward planning in CPM and PERT.   **4**
     (c)   A person is planning to purchase a car. A new car is costing rupees 3 lacs. The resale value of the car at the end of the year is 85 % of the previous year. Maintenance and repair cost during the first year are rupees 10000 and they increase by 15 % every year. The minimum resale value of the car can be rupees 75000. (a) When should the car be replaced to minimize average annual cost? (b) If interest rate of 12 % is assumed, calculate the average cost at the end of 10 years.   **7**

OR

Q.5   **(a)**   Mention any two limitations of critical path.   **3**
     (b)   Explain D.R. Fulkerson's Rule for Network diagram.   **4**
     (c)   Consider the following given data and based on that find out critical path for the given project:

Activity	Time (days)
1-2	6
1-3	9
2-4	3
3-4	4
3-5	8
2-6	12
4-6	7
5-6	1

7

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