GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2020

Subject Code:2171901   **Date:25/01/2021**

Subject Name:Operation Research

Time:10:30 AM TO 12:30 PM   **Total Marks: 56**

Instructions:
1. Attempt any FOUR questions out of EIGHT questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

			MARKS
Q.1	**(a)**	Discuss various areas for the application of operations research techniques.	**03**
	(b)	Differentiate CPM & PERT.	**04**
	(c)	Explain the set of assumptions for Linear Programming in details.	**07**
Q.2	**(a)**	Graphically represent following cases in linear programming. (1) Un-bounded solution (2) Multiple optimal solution	**03**
	(b)	A company is manufacturing two different types of products, A and B. Each product has to be processed on two machines M_1 and M_2. Product A requires 2 hours on machine M_1 and 1 hour on machine M_2, Product B requires 1 hours on machine M_1 and 2 hour on machine M_2. The available capacity of machine M_1 is 104 hours and that of machine M_2 is 76 hours. Profit per unit for product A is Rs.6 and that for B is Rs.11. Formulate the problem.	**04**
	(c)	Maximize $Z = 40 x_1 + 35 x_2$ Subject to constraints, $2x_1 + 3x_2 \le 60$, $4x_1 + 3x_2 \le 96$, $x_1, x_2 \ge 0$	**07**
Q.3	**(a)**	What is assignment problem? Show the assignment problem is special case of transportation problem.	**03**
	(b)	Describe the various steps in Hungarian method used for solving the assignment problem.	**04**
	(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.	**07**

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.4	**(a)**	What is degeneracy in transportation problem?	**03**
	(b)	Discuss group replacement policy with suitable example.	**04**

(c) Five jobs are to be assigned to five machines with an objective to minimize total man-hours. The time (in hours) that each man takes to perform each job is given below. Find the optimum assignment. **07**

		Employees				
		I	**II**	**III**	**IV**	**V**
Jobs	**A**	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

Q.5 **(a)** What is inventory? Classify the inventory. **03**

(b) Write a short note on "ABC analysis" of inventory control technique. **04**

(c) The annual demand for an item is 3200 units. The unit cost is Rs.6 and inventory carrying charges 25 % per annum.If the cost of one procurement is Rs.150, then determine the 1) EOQ 2) No. of order per year 3) Time between two consecutive order 4) The optimal cost. **07**

Q.6 **(a)** Define the following terms relating the customer's behavior in Queue. (A)Balking (B) Jockeying (C) Reneging **03**

(b) Explain Kendall's notation for queuing system. **04**

(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 **07**

Q.7 **(a)** What is "Strategy"? Explain the difference between pure strategy and mixed **03**strategy. Strategy? **03**

(b) Discuss various costs involved in an Inventory model. **04**

(c) Explain the steps of a Travelling Salesman Problem. **07**

Q.8 **(a)** What is replacement? Describe some important replacement situations. **03**

(b) How would you deal with assignment problems, where (a) the objective Function is to be maximized? (b) Some assignments are prohibited? **04**

(c) Explain the different methods useful for decision making under certainty. **07**

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