Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA – SEMESTER IV - EXAMINATION –WINTER-2022

Subject Code: 2640003   **Date: 15/12/2022**
Subject Name: Operations 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.**

Q.1 **(a)** Define Operation research and discuss various applications of OR.   **07**
         (b) Solve the following LP problem using graphical method.   **07**

         Maximize $Z = 60x_1 + 40x_2$, subject to the constraints
         $x_1 \leq 25$
         $x_2 \leq 35$
         $2x_1 + x_2 \leq 60$
         $x_1, x_2 \geq 0$

Q.2 **(a)** Solve the following LP problem using simplex method.   **07**

         Maximize $Z = 4x_1 + 3x_2$, subject to the constraints
         $2x_1 + x_2 \leq 1000$
         $x_1 + x_2 \leq 800$
         $x_1 \leq 400$
         $x_2 \leq 700$
         $x_1, x_2 \geq 0$

         (b) Solve the following LPP using Big M method.   **07**

         Minimize $Z = 600x_1 + 500x_2$, subject to the constraints
         $2x_1 + x_2 \geq 80$
         $x_1 + 2x_2 \geq 60$
         $x_1, x_2 \geq 0$

                                        OR
         (b) A company has two grades of inspectors 1 and 2, the members of which are to be   **07**
         assigned for a quality control inspection. It is required that at least 2000 pieces be
         inspected per hour day. Grade 1 inspectors can check pieces at the rate of 40 per
         hour, with an accuracy of 97 per cent. Grade 2 inspectors check at the rate of 30
         pieces per hour with an accuracy of 95 per cent. The wage rate of Grade 1
         inspector costs Rs 5 per hour while that of a Grade 2 inspector is Rs 4 per hour.
         An error mad by an inspector costs Rs 3 to the company. There are only nine
         Grade 1 inspectors and eleven Grade 2 inspectors available to the company. The
         company wishes to assign work to the available inspectors so as to minimize the
         total cost of the inspection. Formulate this problem s an LP model so as to
         minimize the daily inspection cost.

Q.3 **(a)** Explain the structure of a Queuing system. **07**

(b) Determine initial feasible solution for the following Transportation problem **07** using (1) NWCM (ii) Vogel's Approximation Method.

	D1	D2	D3	D4	Supply
S1	2	3	11	7	6
S2	1	0	6	1	1
S3	5	8	15	9	10
Demand	7	5	3	2	

OR

Q.3 **(a)** Differentiate between PERT Vs CPM. **07**

(b) Differentiate Transportation problem Vs Assignment Problem. **07**

Q.4 **(a)** A department of a company has five employees with five jobs to be performed. **07** The time (in hours) that each man takes to perform each job is given in the effectiveness matrix.

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

How the jobs should be allotted, one per employee so as to minimize the total man-hours?

(b) Discuss various cost components of inventory system. **07**

OR

Q.4 **(a)** An aircraft company uses rivets at a constant rate of 2500 per year. Each unit **07** costs Rs 30. The company personnel estimate that it costs Rs 130 to place an order and that carrying cost of inventory is 10 per cent per year. How frequently should orders be placed? Also determine the optimum size of each order.

(b) Define simulation. Discuss various applications of simulation. **07**

Q.5 **(a)** The cost of a machine is Rs 6100 and its scrap value is only Rs 100. From **07** experience the maintenance costs are found to be :

Year	1	2	3	4	5	6	7	8
Maintenance Cost Rs	100	250	400	600	900	1250	1600	2000

When should the machine be replaced?

(b) What is game theory? Explain two person zero sum game with payoff matrix and **07** saddle point.

OR

Q.5 **(a)** Explain queue discipline and service process of queuing system **07**

(b) Discuss PERT/CPM network components and explain constructing network **07** diagram. What is error and dummy activity in network diagram?

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