

Enrollment No./Seat No.:

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**MCA INTEGRATED - SEMESTER - IV EXAMINATION - WINTER 2025**

**Subject Code: 2648602**

**Date: 29-11-2025**

**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.**
- 4. Use of simple calculators and non-programmable scientific calculators are permitted.**

**Marks**

**Q.1 (a)** Define OR. Write the applications of it.

**07**

**(b)** Get an initial basic feasible solution to the given transportation problem using the North-west corner rule:

**07**

From	D1	D2	D3	D4	Supply
O1	11	13	17	14	250
O2	16	18	14	10	300
O3	21	24	13	10	400
Demand	200	225	275	250	950

**Q.2 (a)** Discuss the reasons for carrying inventory.

**07**

**(b)** A marketing manager has five salesman and five sales districts. Considering the capabilities of the salesman and the nature of districts, the marketing manager estimates that the sales per month (in hundred rupees) for each district would be as follows:

**07**

		Districts				
		A	B	C	D	E
Salesmen	1	32	38	40	28	40
	2	40	24	28	21	36
	3	41	27	33	30	37
	4	22	38	41	36	36
	5	29	33	40	35	39

**OR**

**(b)** A firm is considering the replacement of a machine, whose cost price is Rs. 12,200, and its scrap value is Rs. 200. From experience the running (maintenance and operating) costs are found to be as follows:

**07**

Year	1	2	3	4	5	6	7	8
Running Cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

- Q.3 (a)** Define the terms: Saddle Point, Two - Person Zero Sum Game, Minimax Principle, Maximin Principle. **07**
- (b)** A television repairman finds that the time spent on TV sets has an exponential distribution with a mean of 30 minutes. If he repairs the sets in the order in which they came in, and if the arrival of sets follows a Poisson distribution approximately with an average rate of 10 per 8-hour day, what is the repairman's expected idle time each day in hours? How many jobs are ahead of the average set just brought in? **07**

**OR**

**(a)** **07**

Activity	A	B	C	D	E	F	G	H
Predecessor Activity	-	A	A	B	B, C	E	D, F	G

Draw a network diagram of activities for the project.

- (b)** A book binder has one printing press, one binding machine and manuscripts of 7 different books. The times for performing printing and binding operations for different books are shown below: **07**

Book	1	2	3	4	5	6	7
Printing Time	20	90	80	20	120	15	65
Binding Time	25	60	75	30	90	35	50

Decide the optimum sequence of processing of books in order to minimize the total time required to bring out all the books.

- Q.4 (a)** Discuss the phases of project management. **07**
- (b)** A manufacturing company is engaged in producing three types of products: A, B, and C. The production department produces each day components sufficient to make 50 units of A, 25 units of B, and 30 units of C. The management is confronted with the problem of optimizing the daily production of products in assembly where only 100 man-hours are available daily to assemble the products. The following additional information is available: **07**

Type of Product	Profit Contribution per Unit of Product (Rs)	Assembly Time per Product (hrs)
A	12	0.8
B	20	1.7
C	45	2.5

The company has a daily order commitment for 20 units of products A and a total of 15 units of products B and C. Formulate this problem as an LP model so as to maximize the total profit.

**OR**

- (a)** Explain the advantages and disadvantages of simulation. **07**

- (b) Use the Graphical method to solve the following LP problem: 07  
Maximize  $Z = 15x_1 + 10x_2$   
Subject to the constraints,  
 $4x_1 + 6x_2 \leq 360$ , ii)  $3x_1 + 0x_2 \leq 180$ , iii)  $0x_1 + 5x_2 \leq 200$   
and  $x_1, x_2 \geq 0$ .

**Q.5 (a)** Explain the formulation of LPP with its components. 07

- (b) Use the Simplex method to solve the following LP problem: 07  
Maximize  $Z = 3x_1 + 5x_2 + 4x_3$   
Subject to the constraints,  
 $2x_1 + 3x_2 \leq 8$ , ii)  $2x_2 + 5x_3 \leq 10$ , iii)  $3x_1 + 2x_2 + 4x_3 \leq 15$   
and  $x_1, x_2, x_3 \geq 0$ .

**OR**

(a) Write the assumptions of an LP Model. 07

(b) Write the dual of the following LP problem. 07

- Maximize  $Z = x_1 - x_2 + 3x_3$   
Subject to the constraints,  
i)  $x_1 + x_2 + x_3 \leq 10$ , ii)  $2x_1 - x_2 - x_3 \leq 2$ , iii)  $2x_1 - 2x_2 - 3x_3 \leq 6$   
and  $x_1, x_2, x_3 \geq 0$ .

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