

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

Subject Code: 2171901**Date: 30-05-2024****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) Write the Applications of Operation Research. **03**
 (b) Discuss the Characteristics of Operation Research. **04**
 (c) Solve the following LPP by simplex method: **07**

$$\begin{aligned} \text{Maximize } Z &= 30x_1 + 40x_2 + 50x_3 \\ \text{Subject to } 2x_1 + 3x_2 &\leq 8 \\ 2x_2 + 2x_3 &\leq 10 \\ 3x_1 + 2x_2 + 4x_3 &\leq 15 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

- Q.2** (a) Explain Duality in Linear Programming **03**
 (b) Discuss Types of solutions in Transportation Model **04**
 (c) Solve the following LPP by Big –M method: **07**
 Maximize $Z = 6x_1 + 4x_2$

$$\text{Subject to } 2x_1 + 3x_2 \leq 30$$

$$3x_1 + 2x_2 \leq 24$$

$$x_1 + x_2 \geq 3$$

$$x_1, x_2 \geq 0$$

OR

(c)	Source/Des.	D ₁	D ₂	D ₃	Supply	07
	S ₁	11	9	6	40	
	S ₂	12	14	11	50	
	S ₃	10	8	10	40	
	Demand	55	45	30		

Solve above Transportation matrix by using N-W Corner Method and Penalty Method

- Q.3** (a) What is Degeneracy in case of Transportation Problem? **03**

(b)

04

	J ₁	J ₂	J ₃	J ₄
W ₁	82	83	69	92
W ₂	77	37	49	92
W ₃	11	69	5	86
W ₄	8	9	98	23

Solve the above Assignment matrix using Hungarian Method.

(c)

Source/Des.	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	19	30	50	10	7
S ₂	70	30	40	60	9
S ₃	40	8	70	20	18
Demand	5	8	7	14	

07

Determine Optimum Solution using MODI method.

OR

Q.3 (a) Discuss special cases in Assignment Problem. **03**

(b) Discuss crashing in Project Management **04**

(c) Discuss Elements of Queuing System **07**

Q.4 (a) Discuss different costs associated with Inventory. **03**

(b) Discuss ABC analysis **04**

(c) A company requires 16000 units of raw material costing **07**

Rs. 2 per unit. The cost of placing an order is Rs 45 and the carrying costs are 10% per year per unit of the average inventory. Determine:

(1) the economic order quantity

(2) cycle time

(3) Total variable cost of managing the inventory.

OR

Q.4 (a) Explain the term: (1)Minimax (2) Maximin (3) Saddle point **03**

(b) Discuss various types of floats in Project Management **04**

(c) The capital cost of two machines A and B is same. Their yearly running costs are as follows: **07**

Year	1	2	3	4	5
M/C-A	1800	1200	1400	1600	1000
M/C-B	2800	200	1400	1100	600

Find their cost patterns if interest rate is 10% per year and hence find which machine is most economical.

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

(b) Explain Hurwitz criterion for Decision Theory **04**

(c) Solve the given 3×3 game using algebraic method **07**

Player A	Player B			
		I	II	III
	I	30	40	-80
	II	0	15	-20
	III	90	20	50

OR

Q.5 (a) What is Kendall's Notation? **03**

(b) Discuss various Factors affecting on Replacement Decision **04**

(c)

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	1	1.5	5
2-3	1	2	3
2-4	1	3	5
3-5	3	4	5
4-5	2	3	4
4-6	3	5	7
5-7	4	5	6
6-7	6	7	8
7-8	2	4	6
7-9	5	6	8
8-10	1	2	3
9-10	3	5	7

07

Construct PERT network. Find the critical path and variance for each event.
