Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2021

Subject Code:3151910 Date:24/12/2021

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)**	Illustrate graphically for Linear Programming Problem; (a) No-feasible solution (b) Unbounded solution.	**03**
	(b)	Discuss various areas for the application of operations research techniques.	**04**
	(c)	Mention different phases of operations research and explain their significance for decision making.	**07**
Q.2	**(a)**	What are the assumptions in LPP?	**03**
	(b)	Solve following problem with graphical method. Maximize Z = 3X1+9X2 Subject to X1+4X2 ≤ 8, X1+2X2 ≤ 4 and X1, X2 ≥ 0	**04**
	(c)	Using Simplex method of Linear programming technique, solve the following problem. Maximize Z = 5x1 + 4x2 Subject to x1 – 2x2 ≤ 1, x1 + 2x2 ≥ 3 and x1, x2 ≥ 0.	**07**
		OR	
	(c)	Solve the following problem using Big M method Maximize Z = 4x + 5y Subjects to 2x + 3y ≤ 6, 3x + y ≥ 3 and x, y ≥ 0.	**07**
Q.3	**(a)**	Differentiate CPM & PERT.	**03**
	(b)	Define event, activity, preceder activity, successor activity, dummy activity with respect to CPM/PERT.	**04**
	(c)	Tasks A to I constitutes a project in which the precedence relationships are A < D; A < E; B < F; D < F; C < G; C < H, F < I; G < I. Time in day for each task is as follows: Draw the network to represent the project and find out total float of each activity and identify critical path.	**07**

Task	A	B	C	D	E	F	G	H	I
Time	8	10	8	10	16	17	18	14	9

OR

Q.3 **(a)** What is degeneracy in transportation problem? **03**

(b) What is 'dominance rule' in game theory? How can a 'two person-zero sum game' problem be converted into LP problem? **04**

(c) Solve the following transportation problem for maximum profit. Use vogel's approximation method to find out initial feasible solution. **07**

Market (Per unit profit in Rs.)

Warehouse	A	B	C	D
X	12	18	6	25
Y	8	7	10	18
Z	14	3	11	20

Availability in	Demand in the
X = 200 units	A = 180 units
Y = 500 units	B = 320 units
Z = 300 units	C = 100 units
	D = 400 units

Q.4 **(a)** Discuss group replacement policy with suitable example. **03**

(b) What do you understand by 'zero-sum' in the context of game theory? **04**
Explain the meaning following terms used in game theory;

i. Saddle Point
ii. Pure Strategy
iii. Mixed Strategy

(c) A machine cost Rs 500. Operation and maintenance cost are zero for the first year and increases by Rs. 100 every year. If money is worth 5% every year, determine the best age at which the machine should be replaced. The resale value of the machine is negligibly small. What is the weighted average cost of owning and operating the machine? **07**

OR

Q.4 **(a)** Discuss various costs involved in an Inventory model. **03**

(b) Discuss the difference between decision-making under certainty, under uncertainty and under risk. **04**

(c) The following is the pay-off matrix between player X and player Y. Find the optimal strategies, their frequencies and the value of the game. Use rule of dominance and oddment in calculations. **07**

PLAYER Y / PLAYER X	A	B	C	D
I	0.25	0.20	0.14	0.30
II	0.27	0.16	0.12	0.14
III	0.35	0.08	0.15	0.19
IV	-	0.08	0.13	0.00

Q.5 **(a)** What are various performance measures of a queuing system? Discuss in brief. **03**

(b) What is transhipment problem? Explain how it can be formulated and solved as a transportation problem? **04**

(c) A self-service store employs one cashier at its counter, Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, find **07**

i. Average number of customers in the system
ii. Average number of customers in queue

iii. Average time a customer spends in the system
iv. Average time a customer waits before being served.

OR

Q.5 **(a)** How to tackle the non-square matrix in the assignment problem? Explain with suitable example. **03**

(b) Is it possible to solve assignment problem using transportation technique? Explain with reason. **04**

(c) 1. Define the following terms: balking, reneging and jockeying. **07**

2. Explain in brief characteristic of queuing theory. What is traffic intensity? If traffic intensity of a system is given to be 0.76, what percent of time the system would be idle?

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