Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–V (NEW) EXAMINATION – WINTER 2024

Subject Code:3151910 Date:12-12-2024

Subject Name: Operation Research

Time:10:30 AM TO 01:00 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 characteristics of Operations Research.	**03**
	(b)	Discuss the limitations of linear programming problems.	**04**
	(c)	Sketch the graphical representation of: 1) Infeasible solution, 2) Redundant constraint.	**07**
Q.2	**(a)**	Write the steps involved in dynamic programming.	**03**
	(b)	Explain with example: 1) slack variable, 2) Artificial variable in context of simplex method for LPP.	**04**
	(c)	The following diet chart shows that amount of two vitamins per unit present in two different foods. Formulate primal and dual as well as write the economic interpretation of both.	**07**

Vitamin	Food		Requirement of vitamins units per day
	Spinach	Potato	
A	6	8	100
C	7	12	120
Cost / unit of food	12	20	

OR

(c)	Find initial basic feasible solution by North-west corner method and Least cost method of following transportation problem. Also make comparative comments on obtained solutions.				**07**

	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	34

Q.3	**(a)**	"Transportation problem is an special case of LPP" Justify the statement.	**03**
	(b)	Explain the meaning of unbalanced situation of transportation problem using suitable example.	**04**
	(c)	The supervisor has to assign five machines for operation each. The cost for each operation on each machine is as shown in table. How should supervisor allocate the machine so the total cost can minimize.	**07**

Machine	Operation				
	O1	O2	O3	O4	O5
M1	10	3	3	2	8
M2	9	7	8	2	7
M3	7	5	6	2	4
M4	3	5	8	2	4
M5	9	10	9	6	10

OR

Q.3 **(a)** Write the canonical form of transportation problem. **03**

(b) Write the difference between transportation and assignment problems. **04**

(c) Customers arrive at counter manned by a single person according to a Poisson process with a mean rate of 10 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer in queue and the system. **07**

Q.4 **(a)** Classify the Queuing models. **03**

(b) Explain how theory of replacement we used in replacement of items whose maintenance cost varies with time. **04**

(c) The cost of machine is Rs 60000 and its scrap value is of Rs 1000. The maintenance costs based on past experience are as follow. Find the year of replacement for machine. **07**

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs)	1000	2500	4000	6000	9000	12000	16000	20000

OR

Q.4 **(a)** Define in context of game theory: strategy, Player **03**

(b) Discuss the characteristics of game theory. **04**

(c) The estimated profit from type of crop depends on amount of rainfall as given in following table. If farmer prefer to plant only one crop then suggest best crop option under high, medium and low rainfall condition. Also write the name of decision making environment which has been considered for suggestions. **07**

Rainfall	Conditional profit (Rs)		
	Crop A	Crop B	Crop C
High	8000	3500	4500
Medium	3500	4500	5000
Low	2000	5000	3000

Q.5 **(a)** Define: Activity, Dummy activity **03**

(b) Write the procedure steps for the Hurwicz criterion. **04**

(c) Draw a network for following project; **07**

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

OR

Q.5 **(a)** Explain the term "Looping" in context of networks scheduling **03**

(b) Differentiate between forward and backward planning **04**

(c) Discuss the differences among decision under certainty, decision under risk and decision under uncertainty. **07**

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