Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII • EXAMINATION – SUMMER • 2015

Subject Code: X71903 **Date:**14**/05/2015**

Subject Name: OPERATION RESEARCH

Time:02:30 pm - 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)** Use the graphical method to solve the following LPP **07**

Minimise = 20X1 + 40 X2

Subject to Constraints:

$$36X_1 + 6X_2 \geq 108$$
$$3X_1 + 12X_2 \geq 36$$
$$20X_1 + 10X_2 \geq 100$$
$$X_1, X_2 \geq 0$$

(b) Find the initial basic feasible solution to the following transportation problem using North-west corner method and least cost method. **07**

	P	**Q**	**R**	**S**	**Supply**
A	2	3	11	7	6
B	1	0	6	1	1
C	5	8	15	9	10
Demand	7	5	3	2	

Q.2 **(a)** Solve the following transportation problem for maximum profit. Use VAM method to obtain initial basic feasible solution and MODI method for optimality. **07**

	A	**B**	**C**	**D**	**Supply**
X	12	18	6	25	200
Y	8	7	10	18	500
Z	14	3	11	20	300
Demand	180	320	100	400	

(b) Maximize Z = 10X1 + 5X2 **07**

Subject to

$$4X1 + 5X2 \leq 120$$
$$2X1 + 2X2 \leq 60$$
$$X1, X2 \geq 0$$

Find out the optimal solution by simplex method

OR

(b) Find the dual of the following LPP: **07**

Minimise $Z = 5X_1 - 6X_2 + 4X_3$

Subject to

$$3X_1 + 4X_2 + 6X_3 \geq 9$$
$$X_1 + 3X_2 + 2X_3 \geq 5$$
$$7X_1 - 2X_2 - X_3 \leq 10$$
$$X_1 - 2X_2 + 4X_3 \geq 4$$
$$2X_1 + 5X_2 - 3X_3 = 3$$
$$X1, X2, X3 \geq 0$$

Q.3 **(a)** The maintenance cost and resale value per year of a machine whose purchase price is Rs 7000 is given below: **07**

Year	1	2	3	4	5	6	7	8
Maintenance Cost in Rs	900	1200	1600	2100	2800	3700	4700	5900
Resale value In Rs	4000	2000	1200	600	500	400	400	400

When should the machine be replaced and why?

(b) For the following assignment problem, find the optimal assignment of jobs and the cost of assignments. **07**

		JOBS			
		A	**B**	**C**	**D**
WORKERS	**1**	50	40	60	20
	2	40	30	40	30
	3	60	20	30	20
	4	30	30	20	30
	5	10	20	10	30

OR

Q.3 **(a)** What are the different types of inventories? Explain any three of them in detail. **07**

(b) A particular item has a demand of 9000 units/year. The cost of one procurement is Rs 100 and the holding cost per unit is Rs 2.40 per year. No shortages are allowed and process is instantaneous. Determine **07**

1) The economic lot size
2) The time between orders
3) The number of orders per year
4) The total cost per year if the cost of one unit is Rs 1.

Q.4 **(a)** Solve the following game by using the principle of dominance. Determine the optimal strategies for the player A and B and the value of game. **07**

		Player B's strategies			
		B1	**B2**	**B3**	**B4**
Player A's Strategies	**A1**	35	65	25	5
	A2	30	20	15	0
	A3	40	50	0	10
	A4	55	60	10	15

(b) For the game given below, determine optimal strategy for player A & B using graphical method and also find the value of game. **07**

		Player B's strategies			
		B1	**B2**	**B3**	**B4**
Player A's Strategies	**A1**	8	5	-7	9
	A2	-6	6	4	-2

OR

Q.4 **(a)** A self service store employs one cashier at its counter. Nine customers arrive on an average of every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival and exponential distribution for service time, find **07**

1) Average number of customer in the system
2) Average number of customers in the queue or average queue length
3) Average time a customer spends in the system
4) Average time a customer waits before being served.

(b) State and explain the basic elements/structure of queuing system. **07**

Q.5 **(a)** Draw the network diagram using the following information and find the critical path. **07**

Activity	A	B	C	D	E	F	G	H	I
Preceding activity	-	-	B	B	A	A	F	C,E,G	F
Activity time(weeks)	3	8	6	5	13	4	2	6	2

(b) The PERT time estimates (days) for the activities of a project are given below: **07**

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	4	6	8
2-3	5	7	15
2-4	4	8	12
3-6	15	20	25
3-5	10	18	26
4-6	8	9	16
5-7	4	8	12
6-7	1	2	3
7-8	6	7	8

1) Draw the project network
2) Determine expected project length
3) Determine the standard deviation and variance of the project length.

OR

Q.5 **(a)** What is simulation? Describe the simulation process and explain the limitation of simulation. **07**

(b) Explain dynamic programming. How is it different from linear programming? Explain stages and states in the context of dynamic programming. **07**

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