

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER – VII • EXAMINATION – WINTER 2012

Subject code: X71903**Date: 29/12/2012****Subject Name: Operations Research****Time: 10.30 am - 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.

Q.1 (a) Describe phases of Operations Research. **07**

(b) Maximize $Z = 40 X_1 + 100 X_2$
 Subject to $12 X_1 + 6 X_2 \leq 3,000$ **07**
 $4 X_1 + 10 X_2 \leq 2,000$
 $2 X_1 + 3 X_2 \leq 900$
 $X_1, X_2 \geq 0$
 Solve above L.P.P by graphical method.

Q.2 (a) Find the initial basic feasible solution to the following transportation problem by using (a) NWCM (b) LCM (c) VAM **07**

From	To			Supply
	2	7	4	5
	3	3	1	8
	5	4	7	7
	1	6	2	14
Demand	7	9	18	

(b) Determine the initial basic feasible solution to the following transportation problem using VAM and obtain optimal solution using MODI method. **07**

Factories		A	B	C	D	Capacity
	1	10	30	50	10	7
	2	70	30	40	60	9
	3	40	8	70	20	18
	Requirement	5	8	7	14	

OR

(b) Determine the initial basic feasible solution to the following transportation problem using VAM and obtain optimal solution using Stepping Stone method. **07**

Destinations							
Origins		A	B	C	D	E	Supply
	1	2	11	10	3	7	4
	2	1	4	7	2	1	8
	3	3	9	4	8	12	9
	Demand	3	3	4	5	6	

Q.3 (a) A company has a team of four salesmen and there are four districts where the company wants to start its business. After taking into account the capabilities of salesmen and the nature of districts, the company estimates that the profit per day in rupees for each salesman **07**

in each district is as below.

Salesmen	Districts				
		1	2	3	4
	A	16	10	14	11
	B	14	11	15	15
	C	15	15	13	12
	D	13	12	14	15

Find the assignment of salesmen to various districts which will yield maximum profit.

- (b) The cost of a machine is Rs. 6,100 and its scrap value is Rs. 100. The maintenance costs found from experience are as follows: **07**

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

OR

- Q.3** (a) Solve the following assignment problem: **07**

	A	B	C	D	E
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

- (b) A taxi owner estimates from his past records that the costs per year of operating a taxi whose purchase price when new is Rs. 60,000 are as given below. **07**

Age	1	2	3	4	5
Operating cost (Rs.)	10000	12000	15000	18000	20000

After 5 years, the operating cost is Rs. 6,000 k, where k = 6,7,8,9,10 (k denoting age in years). If the resale value decreases by 10% of purchase price each year, what is the best replacement policy?

- Q.4** (a) Reduce the following game by Dominance and find the game value. **07**

Player A	Player B				
		I	II	III	IV
	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

- (b) Define Following Terms: 1. Game **07**
2. Strategy
3. Pay Off

4.Mixed Strategy

OR

- Q.4 (a)** A self-service store employs one cashier at its counter nine customer arrives on an average every five minutes while the cashier can serve ten customers in five minutes. Assuming poisson distribution for arrival rate and exponential distribution for service rate, find **07**

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

- (b)** A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at Rs. 50 per unit from the manufacturer. The cost of ordering and transportation from the manufacturer is Rs. 75 per order. The cost of carrying inventory is 7.5% per year of the cost of the product. Find **07**
1. The economical lot size,
 2. The total optimal cost (including the capital cost).

- Q.5 (a)** Given the following data, prepare a network and determine the earliest time, latest time and slack for each event. Also identify the critical path. **07**

Activity	1-2	1-3	1-4	2-5	2-8	3-6	4-6	4-7
Time	6	3	5	4	5	7	4	6
Activity	5-8	6-8	6-9	7-9	8-10	9-10		
Time	3	4	3	2	6	5		

- (b)** The time estimates (in weeks) for the activities of a PERT network are given below. **07**

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

1. Draw the project network and identify all the paths through it.
2. Determine the expected project length.
3. Calculate the standard deviation and variance of the project length.

OR

- Q.5 (a)** Generate a sequence of 5 three digit random numbers such that $R_{i+1} = (301 R_i + 503) \pmod{1,000}$, and $R_0 = 500$. **07**

- (b)** Explain the Bellman's principle of optimality. **07**
