

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC - SEMESTER-VII • EXAMINATION – SUMMER 2013****Subject Code: X 71903****Date: 16-05-2013****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 scope of O.R. in modern management. **07****(b)** Maximize $Z = 3X_1 + 4X_2$ **07**Subject to $X_1 + X_2 \leq 450$ $2X_1 + X_2 \leq 600$ $X_1, X_2 \geq 0$

Solve above L.P.P by Simplex 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
	5	1	7	10
	6	4	6	80
	3	2	5	15
	5	3	2	40
Demand	75	20	50	

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

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

Factories		A	B	C	D	Capacity
	1	14	25	45	5	6
	2	65	25	35	55	8
	3	35	3	65	15	16
	Requirement	4	7	6	13	

Q.3 (a) Five wagons are available at stations 1,2,3,4 and 5. These are required at five stations A,B,C,D and E. The mileages between various stations are given by the table below. How should the wagons be transported so as to minimize the total mileage covered? **07**

Wagons	Stations					
		A	B	C	D	E
	1	10	5	9	18	11
	2	13	9	6	12	14
	3	3	2	4	4	5
	4	18	9	12	17	15
	5	11	6	14	19	10

- (b) The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7,000 is given below. 07

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	900	1200	1600	2100	2800	3700	4700	5900
Resale Value (Rs.)	4000	2000	1200	600	500	400	400	400

When should the machine be replaced?

OR

- Q.3** (a) Four different jobs can be done on four different machines. The set up and take down time costs are assumed to be prohibitively high for change overs. The matrix below gives the cost in rupees of producing job I on machine j. 07

Jobs	Machines				
		M ₁	M ₂	M ₃	M ₄
	J ₁	5	7	11	6
	J ₂	8	5	9	6
	J ₃	4	7	10	7
	J ₄	10	4	8	3

How should the jobs be assigned to the various machines so that the total cost is minimized?

- (b) Fleet cars have their costs increasing as they continue in service due to increased direct operating cost (gas and oil) and increased maintenance (repairs, tyres, batteries, etc.). The initial cost is Rs. 3,800 and the trade-in value drops as time passes until it reaches a constant value of Rs. 600. Given the cost of operating, maintaining and the trade-in value, determine the proper length of service before cars should be replaced. 07

Years of service	1	2	3	4	5
Year end trade in value (Rs.)	2000	1200	800	700	600
Annual operating cost (Rs.)	1600	1900	2200	2500	2800
Annual maintenance cost (Rs.)	400	500	700	900	1100

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

Player A	Player B					
		1	2	3	4	5
	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5
	IV	2	0	6	3	1

(b) Explain characteristics of Games.

07

OR

Q.4 (a) A branch of Punjab national bank has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8-hour work day. If the type writer is valued at Rs. 1.50 per hour, determine

07

1. Equipment Utilization
2. The percent time an arriving letter has to wait.
3. Average system time.
4. Average idle time cost of the typewriter per day.

(b) ABC manufacturing company purchase 9,000 parts of a machine for its annual requirement, ordering one month's usage at a time. Each part costs Rs. 20. The ordering cost per order is Rs. 15, and the carrying charges are 15% of the average inventory per year. You have been asked to suggest a more economical purchasing policy for the company. What advice would you offer and how much would it save the company per year?

07

Q.5 (a) The utility data for a network is given below. Determine the total, free and independent floats and identify the critical path.

07

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Time	2	8	10	6	3	3	7	5	2	8

(b) The PERT time estimates for the activities of a project are given below.

07

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	7	8	9
1-3	5	7	8
2-6	6	9	12
3-4	4	4	4
3-5	7	8	10
3-6	10	13	19
4-5	3	4	6
5-6	4	5	7
5-7	7	9	11
6-7	3	4	8

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)** In the mixed congruential recursive equation $X_{n+1} = (A X_n + B) \pmod{m}$, what should be the value of m so that the random numbers generated are between 0 and 40? Generate a string of 5 such numbers. **07**
- (b)** A student has to appear in the three examinations and he has three days before examination. He wants to revise the whole syllabus of the subjects before examinations by devoting a single day, two days or not a single day to any subject based on given estimate of expected grade points as shown below. How he should plan his study? **07**

	Course Sections		
Days	I	II	III
0	0	1	0
1	1	1	1
2	1	3	4
3	3	4	3
