

**GUJARAT TECHNOLOGICAL UNIVERSITY****PDDC - SEMESTER-VII • EXAMINATION – WINTER • 2014****Subject Code: X 71903****Date: 03-12-2014****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)** **07**

$$\text{Maximize } Z = 40 X_1 + 100 X_2$$

$$\text{Subject to } 12 X_1 + 6 X_2 \leq 3,000$$

$$4 X_1 + 10 X_2 \leq 2,000$$

$$2 X_1 + 3 X_2 \leq 900$$

$$X_1, X_2 \geq 0$$

Solve above L.P.P by graphical method.

**Q.2 (a)** Find the initial basic feasible solution to the following transportation problem by using NWCM and use MODI method to obtain the solution **07**

	<b>P</b>	<b>Q</b>	<b>R</b>	<b>SUPPLY</b>
<b>A</b>	11	9	6	40
<b>B</b>	12	14	11	50
<b>C</b>	10	8	10	40
<b>DEMAN</b>	55	45	30	

**(b)** Solve the following assignment problem: **07**

		<b>Jobs</b>			
		<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>Workers</b>	<b>1</b>	45	40	51	67
	<b>2</b>	55	40	61	53
	<b>3</b>	49	52	48	64
	<b>4</b>	41	45	60	55

**OR****(b)** Determine the initial basic feasible solution to the following transportation problem using VAM and obtain the optimal solution. Also find transportation cost. **07**

	<b>TO</b>			<b>SUPPLY</b>
	11	9	6	40
	12	14	11	50
	10	8	10	40
<b>FROM</b>	55	45	30	

**Q.3 (a)** What is degeneracy in transportation problems? Explain how to resolve degeneracy in a transportation problem. **07**

**(b)** The labour contract between management and the union will terminate in the near future. A new contract must be negotiated preferably before the old one expires. You are a member of the management group charged with selecting a strategy for them during the coming negotiations. After a consideration of past experience, the group agrees that feasible strategies for the company and union are :

- 1) All out attack, hard aggressive bargaining
- 2) A reasonably logical approach
- 3) A legalistic strategy
- 4) An agreeable conciliatory approach. The payoff table is given below:

		Union			
		a	b	c	d
Company Strategies	1	20	1	12	35
	2	25	1	8	10
	3	40	2	19	5
	4	5	4	11	0

Find optimal strategy for the company. Determine the worth of your negotiations.

**OR**

**Q.3 (a)** A truck owner finds from his past experience that the maintenance costs Rs 200 for the first year and then increases by Rs 2000 every year. The cost of the truck type A is Rs 9000. Determine the best age at which to replace the truck. Truck B type costs Rs 10000. Annual maintenance costs are Rs 400 and increases by Rs 800 every year. The truck owner now has truck A, which is one year old. Should it be replaced by type B and if so, when? **07**

**(b)** Explain the various elements of queuing system in detail **07**

**Q.4 (a)** Write the dual of the following LP problem: **07**

$$\text{Maximise } Z = 3X_1 + 4X_2 + 7X_3$$

Subject to the constraints:

$$X_1 + X_2 + X_3 \leq 10$$

$$4X_1 - X_2 - X_3 \geq 15$$

$$X_1 + X_2 + X_3 = 7$$

$$X_1, X_2 \geq 0 \quad X_3 \text{ unrestricted in sign}$$

**(b)** Using the dominance rule, obtain the optimal strategies for both the players and determine the value of the game. The payoff matrix for player A is given below: **07**

		PLAYER				
		1	2	3	4	5
PLAYER-A	P	2	4	3	8	4
	Q	5	6	3	7	8
	R	6	7	9	8	7
	S	4	2	8	4	3

**OR**

**Q.4 (a)** Explain clearly with suitable examples the different costs that are involved in the Inventory problem **07**

**(b)** Information on the activities required for a project is as follows: **07**

Name	A	B	C	D	E	F	G	H	I	J	K
Activities (Node)	1 - 2	1 - 3	1 - 4	2 - 5	3 - 5	3 - 6	3 - 7	4 - 6	5 - 7	6 - 8	7 - 8
Duration (days)	2	7	8	3	6	10	4	6	2	5	6

Draw the network and find critical path.

**Q.5 (a)** What do you mean by linear programming? **07**

Define following terms : linear function, objective function, decision variable, constraints, feasible solution, optimal solution.

**(b)** What is the simulation? Classify the simulation model? Explain the general Simulation methodology. **07**

**OR**

**Q.5 (a)** Define following terms with respect to CPM/PERT : event, merge event, burst event, activity, processor activity, successor activity, dummy activity **07**

**(b)** Do as directed with reference to dynamic programming **07**  
(i) Explain the terms: State, Stage and Policy  
(ii) Explain Bellman's Principle of Optimality  
(iii) Explain: Transformation function and Return function

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