Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII • EXAMINATION – SUMMER • 2014

Subject Code: X 71903 **Date: 03-06-2014**

Subject Name: Operations 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 LP problem: **07**

Maximize $Z = 8X_1 + 6X_2$

subject to constraints:

$$2X_1 + X_2 \leq 1000$$
$$X_1 + X_2 \leq 800$$
$$X_1 \leq 400$$
$$X_2 \leq 700$$
$$X_1, X_2 \geq 0$$

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

Maximise $Z = 8X_1 + 10X_2 + 5X_3$

Subject to

$$X_1 - X_3 \leq 4$$
$$2X_1 + 4X_2 \leq 12$$
$$X_1 + X_2 + X_3 \geq 2$$
$$3X_1 + 2X_2 - X_3 = 8$$
$$X_1, X_2, X_3 \geq 0$$

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**

	P	**Q**	**R**	**SUPPLY**
A	11	9	6	40
B	12	14	11	50
C	10	8	10	40
DEMAND	55	45	30	

(b) Maximize $Z = 6X_1 + 11X_2$ **07**

Subject to

$$2X_1 + X_2 \leq 104$$
$$X_1 + 2X_2 \leq 76$$
$$X_1, X_2 \geq 0$$

Find out the optimal solution by simplex method.

OR

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

	P	**Q**	**R**	**S**	**SUPPLY**
A	12	10	12	13	500
B	7	11	8	14	300
C	6	16	11	7	200
DEMAND	180	150	350	320	

Q.3 **(a)** Following table gives the cost of spares per year, overhead cost of maintenance per year and the resale value of certain equipment whose purchase price is Rs 50,000. Determine the optimum period for replacement: **07**

year(n)	**1**	**2**	**3**	**4**	**5**
Cost of spares(Rs)	10,000	12,000	14,000	15,000	17,000
Resale value (Rs)	40,000	32,000	28,000	25,000	22,000
Maintenance cost (Rs)	5000	5000	6000	6000	8000

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

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

OR

Q.3 **(a)** A machine M1, costing Rs 9000 has a maintenance cost of Rs 200 in the first year of its operation which rises by Rs 2000 in each of the successive years. Assuming that the machine replacement can be done only at the end of a year, determine the best age at which the machine be replaced. **07**

Also there is an offer to replace the machine M1 which is a year old, by another machine M2 which costs Rs 8000. The machine M2 needs Rs 2000 to be spend on installation, has no resale value, and requires Rs 400 on maintenance in the first year followed by an increase of Rs 800 per annum in the yearly expenditure on maintenance. Should the machine M1 be replaced by machine M2? If so, when?

(b) Define Inventory. What are the various types of inventory? Why they are maintained? **07**

Q.4 **(a)** 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 **07**

2) A reasonably logical approach 3) A legalistic strategy

4) An agreeable conciliatory approach. The payoff table is given below:

		Union strategies			
		a	**b**	**c**	**d**
Company Strategies	**1**	20	15	12	35
	2	25	14	8	10
	3	40	2	19	5
	4	5	4	11	0

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

(b) Customer arrive at one person barber shop according to a Poisson distribution with a mean arrival time of 20 minutes. Customer spend on an average 15 minutes in the barbers chair. **07**

(i) What is the probability that new arrival need not wait for the barber to free.

(ii) What is expected no. of customers in the barbers shop?

(iii) How much time can a customer expect to wait for his turn?

(iv) How much time can a customer expect to spend in the shop?

OR

Q.4 **(a)** Explain the following terms in the context of game theory: **07**

(a) Saddle point (b) Pure strategy (c) Mixed strategy (d) Payoff matrix

(b) Give a general structure of the queuing system and explain. Illustrate some queuing situations **07**

Q.5 **(a)** Draw a network corresponding to the following information. Determine critical path. **07**

Activity	**1 to 2**	**1 to 3**	**2 to 6**	**3 to 4**	**3 to 5**	**4 to 6**	**5 to 6**	**5 to 7**	**6 to 7**
Duration	4	6	8	7	4	6	5	19	10

(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	2	5	8
2-3	1	1	1
3-5	0	6	18
5-6	7	7	7
1-4	3	3	3
4-5	2	8	14

1) Draw the project network
2) Determine the expected project duration.

OR

Q.5 **(a)** What do you mean by simulation? Discuss the advantages and disadvantages of simulation. **07**

(b) What is dynamic programming? What are the applications of dynamic programming? Explain the principle of optimality, state and stage in the context of dynamic programming. **07**

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