

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- VIIth SEMESTER-EXAMINATION – MAY/JUNE- 2012****Subject code: 172503****Date: 09/06/2012****Subject Name: Optimization Methods****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)** Construct the dual of the problem: **10**
 Maximize $Z = 3x + 5y$
 Subject to $X - 2y \geq 3$
 $X + 3y \geq 9$
 $X - y \leq 5$
 $X \geq 0$, is unrestricted in sign

Solve the dual

- (b)** Describe the process to develop LP model **04**

- Q.2 (a)** A firm manufactures three products A, B & C. Their profits per unit are Rs.300, Rs.200 and Rs.400, respectively. The firm has two machines and the required processing time in minutes on each machine for each product is given in the following table: **05**

	Product		
	A	B	C
Machine 1	4	3	5
Machine 2	2	2	4

Machines 1 and 2 have 2000 and 2500 machine minute, respectively. The upper limits for the production volumes of the product A, B & C are 100 units, 200 units and 50 units, respectively. But, the firm must produce a minimum of 50 units of the product A. Develop a LP model for this manufacturing situation to determine the production volume of each product such that the total profit is maximized.

- (b)** Maximize $Z = 6x + 10y + 8z$ **09**
 Subject to $2x + 3y \leq 8$
 $2y + 5z \leq 10$
 $3x + 2y + 4z \leq 15$
 $x, y, z \geq 0$

OR

- (b)** Minimize $Z = 20x_1 + 10x_2$ **09**
 Subject to $x_1 + 2x_2 \leq 40$
 $3x_1 + x_2 = 30$
 $4x_1 + 3x_2 \geq 60$
 $x_1, x_2 \geq 0$ Use (i) Big 'M' Method.

- Q.3 (a)** Customer arrivals at a teller counter in a Commercial Bank are considered to be following Poisson probability distribution with an average time of 10 minutes between one arrival and the next. The time length of service that is rendered is assumed to be distributed exponentially with mean three minutes **07**
1. What is the probability that a person arriving at the teller will have to wait?
 2. What is the average length of queue that forms from time to time?
 3. The Commercial Bank will install a second teller man when convince that the arrival rate increase in order to justify the second booth. When does this happen?
- (b)** Write mathematical model of Transportation and Assignment problem and explain them in detail **07**

OR

- Q.3** A company has received a contract to supply gravel for three new construction projects located in towns A, B and C. Construction engineers have estimated the required amounts of gravel which will be needed at these construction projects as shown below: **14**

Project location	Weekly requirement (Truck loads)
A	72
B	102
C	41

The company has three gravel plants X, Y and Z located in three different towns. The gravel required by the construction projects can be supplied by these three plants. The amount of gravel which can be supplied by each plant is as follows:

Plant	Amount available/week (Truck loads)
X	76
Y	62
Z	77

The company has computed the delivery cost from each plant to each project site. These costs (in rupees) are shown in the following table:

		Cost per load		
		A	B	C
Plant	X	4	8	8
	Y	16	24	16
	Z	8	16	35

- (a) Schedule the shipment from each plant to each project in such a manner so as to minimize the total transportation cost within the constraints imposed by plant capacities and project requirements.
- (b) Find the minimum cost.
- (c) Is the solution unique? If it is not, find alternative schedule with the same minimum cost.

- Q.4 (a)** Consider the problem of assigning four sales persons to four different sales regions as shown below such that the total sales is maximized. **07**

		Sales region			
		1	2	3	4
Salesman	1	5	11	8	9
	2	5	7	9	7
	3	7	8	9	9
	4	6	8	11	12

The cell entries represent annual sales figures in crores of rupees. Find the optimal allocation of the sales persons to different regions.

- (b)** Describe Kandell's notations of queuing in detail. **07**

OR

- Q.4 (a)** Describe monte carlo simulation procedure and its applications in the different types of organization **07**

- (b)** Solve following game problem **07**

		B		
		1	2	3
A	1	4	7	9
	2	11	6	10
	3	5	6	9

- Q.5 (a)** Discuss Two-Person Zero Sum game and pay off matrix in detail. **07**

- (b)** Solve following game problem using LP method **07**

		B		
		1	2	3
A	1	5	7	9
	2	4	8	11

OR

- Q.5** Design a waiting line simulation model at bank. Use following data and simulate for 15 customers **14**

Interarrival Time of Customer Minutes	Frequency	Service Time Minutes	Frequency
5	25	3	30
6	15	4	25
7	30	5	20
8	20	6	15
