

**GUJARAT TECHNOLOGICAL UNIVERSITY****M.E Sem-I Regular Examination January / February 2011****Subject code: 711305N****Subject Name: Statistic and Optimization Techniques****Date: 03 /02 /2011****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)** 1. Explain Normal Distribution with an example. **07**  
 2. How you decide the number of sample to be collected for the given confidence level and the marginal error?
- (b)** Using Simplex method solve the following L. P. model **07**  
 Maximize  $Z = 6x_1 + 8x_2$   
 Subject to  $5x_1 + 10x_2 \leq 60$   
 $4x_1 + 4x_2 \leq 40$   
 $x_1, x_2 \geq 0$

- Q.2 (a)** The following table shows how many weeks a sample of 6 persons have worked at an automobile inspection station and the no. of cars each one inspected between noon and 2 pm on a given day. **07**

|                             |    |    |    |    |    |    |
|-----------------------------|----|----|----|----|----|----|
| No. of week employed( $x$ ) | 4  | 12 | 10 | 4  | 5  | 12 |
| No of cars inspected( $y$ ) | 16 | 25 | 22 | 18 | 19 | 25 |

1. Find equation of least square line which will predict  $y$  in terms of  $x$ . Also calculate Standard error.
  2. Predict how many cars someone who has been working at the inspection site for 15 weeks can be expected.
- (b)** What are the factors to be consider while designing questionnaire? **07**
- OR**
- (b)** What is hypothesis testing? What are the types of hypothesis testing? Explain with example. **07**

- Q.3 (a)** Write mathematics formulation of transportation problem and explain its application with an example. **07**
- (b)** Check whether following can be define probability distribution and explain the justify your answer for each **07**
1.  $f_{(x)} = \frac{x}{15} \quad x = 0,1,2,3,4,5$
  2.  $f_{(x)} = \frac{5-x^2}{6} \quad x = 0,1,2,3$

**OR**

- Q.3 (a)** Define and Explain parameters of M/M/1 model of queuing system and its application. **07**
- (b)** Explain Binomial distribution with and Example **07**
- Q.4 (a)** What is the probability that the World Series to team will last 4 games? 5 games? 6 games? Assume that the teams are evenly matched. **07**
- (b)** Explain dual simplex method and state its advantage. Write the mathematical formulation of dual simplex. **07**

**OR**

- Q.4 (a)** 1. What do you understand by discrete distribution? List the types of discrete distribution. Explain any one in detail. **07**  
 2. What do you understand by continuous distribution? List the types of continuous distribution. Explain any one in detail.
- (b)** Write dual for the following **07**  
 Maximize  $Z = x_1 + x_2$   
 Subject to  $x_1 + 2x_2 \leq 4$   
 $4x_1 + 2x_2 \leq 12$   
 $-x_1 + x_2 \leq 1$   
 $x_1, x_2 \geq 0$

- Q.5 (a)** 1. Explain single variable optimization. Explain the sufficient and necessary conditions for the same. **07**  
 2. What is multivariable optimization with no constraints problem? Explain the sufficient and necessary conditions for the same.
- (b)** A taxi hire company has one taxi at each of five depots a, b, c, d and e. A customer requires a taxi in each town, namely A, B, C, D and E. Distances (in kms) between depots (origins) and towns (Destinations) are given in the following distance matrix: How should taxis be assigned to customers so as to minimize the distance travelled? **07**

| Cost Matrix | a   | b   | c   | d   | e   |
|-------------|-----|-----|-----|-----|-----|
| A           | 140 | 110 | 155 | 170 | 180 |
| B           | 115 | 100 | 110 | 140 | 155 |
| C           | 120 | 90  | 135 | 150 | 165 |
| D           | 30  | 30  | 60  | 60  | 90  |
| E           | 35  | 15  | 50  | 60  | 85  |

**OR**

- Q.5 (a)** Determine an initial basic feasible solution to the following transportation problem using the North-West corner rule: **07**

|          | D1 | D2 | D3 | D4 |    |    | Available |
|----------|----|----|----|----|----|----|-----------|
| O1       | 6  | 4  | 1  | 5  | 16 | <= | 14        |
| O2       | 8  | 9  | 2  | 7  | 26 | <= | 16        |
| O3       | 4  | 3  | 6  | 2  | 15 | <= | 5         |
|          | 18 | 16 | 9  | 14 |    |    |           |
|          | =  | =  | =  | =  |    |    |           |
| Required | 6  | 10 | 15 | 4  |    |    |           |

- (b)** Write a mathematical formulation of Assignment problems. Explain its application. **07**  
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