Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY
ME Semester –I Examination Feb. - 2012

Subject code: 711305N **Date: 21/02/2012**
Subject Name: Statistics and Optimization Techniques
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)** Define: Random sample, Null hypotheses, Statistical control, Decision variable, Feasible solution, Optimal solution, Objective function. **07**

(b) Fill in the blanks… **07**

(i) When all the constraints are of '>=' type then we have to introduce a new variable is called _____.

(ii) If there is no combinations of the values of the decision variables satisfying all the constraints of the LP model than that model is said to have a _____ solution.

(iii) A set of data having same categories or characteristics is referred as a _____ .

(iv) Dealing with the collection, processing, analysis and interpretation of numerical data is called _____.

(v) The approach which accounts formally for at least some of the subject in factors is refer as _____.

(vi) A _____ from a statistical population is the subset of measurements that are actually collected in the course of an investigation.

(vii) If A and B are any events in S, then $P(A \cup B)$ = _____ .

Q.2 **(a)** It has been claimed that in 60 % of all solar heat installations the utility bill is reduced by at least one-third. Accordingly, what are the probabilities that the utility bill will be reduced by at least one-third in (i) four of five installations (ii) at least four of five installations ? **07**

(b) Using Simplex method solve the following L. P. model **07**

$$\text{Maximize } Z = 3x_1 + 4x_2 \quad \text{Subject to } x_1 + x_2 \le 450$$
$$2x_1 + x_2 \le 600; \quad x_1, x_2 \ge 0$$

OR

(b) (i) Check whether the following can define probability distribution ? **07**

$f(x) = \frac{x}{15}$ for $x = 0,1,2,3,4,5$ x^2

$f(x) = (5 - x^2) / 6$ for $x = 0,1,2,3$

$f(x) = 1 / 4$ for $x = 3,4,5,6$

(ii) Human error is given as the reason for 75% of all accidents on a rural road. Use binomial distribution to find the probability that human error will be given as the reason for two of the next four accidents.

Q.3 **(a)** Discuss the application areas of queuing theory and explain different terminologies used in queuing system. **07**

(b) The following are data on the drying time of a certain varnish and the amount of an additive that is intended to reduce the drying time. Fit a 2nd degree polynomial by the method of least squares. **07**

Amount of varnish additive (grams) X	Drying time(hours) Y
0	12.0
1	10.5
2	10.0
3	8.0
4	7.0
5	8.0
6	7.5
7	8.5
8	9.0

OR

Q.3 **(a)** Explain Chebyshev's Theorem with diagram. **07**

(b) The following are the number of twists that were required to break 12 forged alloy bars: 33,24,39,48,26,35,38,54,23,34,29 and 37, Find the mean, median, variance , standard deviation and co-efficient of variance. **07**

Q.4 **(a)** Define and explain Statistical inference, Bayesian approach, Frequency distribution, and quartiles. **07**

(b) In three recent years , the price of coppers was 69.6, 66.8 and 66.3 cents per pound and the price of bituminous coal was 19.43, 19.82, 22.40 dollars per tones. Which of the two sets are relatively more variable. **07**

OR

Q.4 **(a)** Use venn diagram to verify that **07**

(i) $(\overline{A \cap B}) = \bar{A} \cup \bar{B}$

(ii) $A \cup (A \cap B) = A$

(iii) $(A \cap B) \cup (A \cap \bar{B}) = A$

(iv) $(A \cup B) = (A \cap B) \cup (A \cap \bar{B}) \cup (\bar{A} \cap B)$

(v) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(b) Discuss various computer applications for statistics and optimization techniques. **07**

Q.5 **(a)** Discuss the steps in Hungarian method. **07**

(b) Consider the following transportation problem involving three sources and four destination, Obtain the initial basic feasible solution using following methods (i) N-W corner cell method (ii) Least cost cell method and (iii) Vogel's approximation method. **07**

Destination/ Sources	1	2	3	4	Supply
1	3	1	7	4	300
2	2	6	5	9	400
3	8	3	3	2	500
Demand	250	350	400	200	1200

OR

Q.5 **(a)** Discuss zero one programming model for assignment problem. **07**

(b) A quality control engineer inspects a random sample of 3 batteries from each lot of 24 car batteries that is ready to be shipped. If such a lot contains 6 batteries with slight defects, what are the probabilities that the inspector's sample will contain (i) none of the batteries with defects; (ii) only one of the batteries with defects; (iii) at least two of the batteries with defects? **07**

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