Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 711403N **Date: 03-01-2014**

Subject Name: Statistical and Numerical Analysis

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.**
4. **Use of statistical tables is allowed.**

Q.1 **(a)** Use Lagrange's interpolation formula to find the value of y when $x = 10$, if the values of x and y are given below: **07**

x	5	6	9	11
y	12	13	14	16

(b) Solve the following equations by Gauss-Seidel method. **07**

$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$

Q.2 **(a)** Evaluate $I = \int_0^1 \frac{dt}{1+t}$ by Gaussian formula with two and three points. **07**

(b) Using Gauss elimination method solve the system of equation: **07**

$$w - x + 3y - 3z = 3$$
$$2w - 3x + y - 11z = 1$$
$$5w - 2x + 5y - 4z = 5$$
$$3w + 4x - 7y + 2z = -7$$

OR

(b) Fit a straight line for the following data of speed at a given time. **07**

X	0	20	40	60	80	100	120
Y	0	30	55	90	110	135	160

Find a law of the form Y=a+bX and hence estimate Y at time X=105.

Q.3 **(a)** Using Gauss Jordan method find the inverse of the matrix **07**

$$A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$$

(b) If a card is drawn from a well shuffled deck of 52 cards, what is the probability of drawing **07**

(i) a red king
(ii) a black card
(iii) a red ace or a black queen?

OR

Q.3 **(a)** Evaluate $\int_0^2 e^{x^2} dx$ by Trapezoidal Rule with $h = 0.25$. **07**

(b) In a draw there are 600 tickets. What is the probability of drawing a number **07**

(i) divisible by 40

(ii) whose last digit is 7

(iii) Whose first digit is 3.

Q.4 **(a)** A car company makes four types of cars out of which 25% A type, 45% B type and remaining C type. In A type 10% cars are defective, in B type 5% are defective and in C type 6% are defective. If a car is purchased from the company and found to be defective what is the probability that it is of type C? **07**

(b) A company makes a profit of $30 on an item if it is in perfect condition and arrives on time, but it is reduced by $5 if it does not arrive on time and by $ 10 if it is not in perfect condition. If 60% of items are in perfect condition and arrives on time, 25 % are in perfect condition but do not arrive on time and remaining are not in perfect condition. What is the company's expected profit per item? **07**

OR

Q.4 **(a)** If the probability is 0.25 that certain bridge will fail under a given load, what are the probability that among 15 such bridges **07**

(i) at most 3 will fail,

(ii) at least 4 will fail?

Q.4 **(b)** The following is the breaking strength of a sample of thread. Prepare a frequency distribution and Histogram for the breaking strength. **07**

68.0	37.1	45.0	79.7	36.1	39.7
72.6	63.4	66.1	44.8	44.0	58.7
51.8	70.1	33.2	61.0	57.2	56.6
65.7	40.8	75.7	30.9	38.7	78.7
45.0	55.7	66.8	68.2	50.9	50.1
41.3	37.6	34.5	39.3	77.8	78.9
44.6	49.3	72.6	76.7	57.8	73.9

Choose one class as 30.0 – 39.9.

Q.5 **(a)** A scientist want to determine the time to rotate a bearing and he want to be able to assert with 95% confidence that the mean of his sample is off by at most 0.45 minute. If he can presume from past experience that $\sigma = 1.9$ minutes. Determine the sample size that he can take. **07**

(b) Test the null hypothesis $\mu \geq 3600$ with a level of significance 0.01. Given that the sample size is 50 and sample mean is 3245 and standard deviation is 348. **07**

OR

Q.5 **(a)** Construct a 99% confidence interval for the following. The size of sample is 80, variance of the sample 30.77 and mean of the sample is 18.85. p.228 **07**

(b) Whether the null hypothesis $\mu = 800$ is rejected against the alternative hypothesis $\mu > 800$ with a level of significance 0.05. Given that the sample size is 75 and sample mean is 825 and standard deviation is 75. **07**

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