

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 $x=10$, **07**
 if the values of x and y are given below:

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
- divisible by 40
 - whose last digit is 7
 - 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

- at most 3 will fail,
- 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
