Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2014

Subject code: 711403 **Date: 03-12-2014**

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 mark.**

Q.1 **(a)** Use Lagrangeôs interpolation formula, fit a polynomial to the data: **[07]**

x	0	1	3	4
y	-12	0	6	12

Also, find the value of y at $x = 2$.

(b) Solve the following system of equations using Gauss Seidel method. **[07]**

$$10x + y + z = 6$$
$$x + 10y + z = 6$$
$$x + y + 10z = 6$$

Q.2 **(a)** Evaluate $\int_0^1 \exp\left(-x^2\right)dx$ by Gaussian integration formula for three points. **[07]**

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

$$3x_1 - 0.1x_2 - 0.2x_3 = 7.85$$
$$0.1x_1 + 7x_2 - 0.3x_3 = -19.3$$
$$0.3x_1 - 0.2x_2 + 10x_3 = 71.4$$

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]**

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$$

(b) If two balanced dice are thrown, what is the probability that sum of the faces is **[07]**

(i) Multiple of 2
(ii) more than 10
(iii) 3, 4 or 5

OR

Q.3 **(a)** Evaluate $\int_0^1 \left(4x - 3x^2\right) dx$ by Simpsonôs 1/3 rule by taking n=10. **[07]**

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

(i) a red card
(ii) a black king
(iii) a club or 10?

Q.4 **(a)** A television manufacturing company makes four types of television out of which 30% A type, 45% B type and remaining C type. In A type 6% televisions are defective, in B type 5% are defective and in C type 10% are defective. If a television is selected at random and found to be defective what is the probability that it is of type A? **[07]**

(b) A company makes a profit of 25 rupees on an item if it is in perfect condition and arrives on time, but it is reduced by 2 rupees if it does not arrive on time and by 5 rupees if it is not in perfect condition. If 65% of items are in perfect condition and arrives on time, 20 % are in perfect condition but do not arrive on time and remaining are not in perfect condition. What is the companyôs expected profit per item? **[07]**

OR

Q.4 **(a)** If the probability is 0.25 that certain tube will blast under a given pressure, what are the probability that among 15 such tubes **[07]**

(i) at most 3 will fail,
(i) at least 4 will fail?

Q.4 **(b)** The following is the marks obtained by student in a 50 marks test. Prepare a frequency distribution and Histogram for the breaking strength. **[07]**

50	43	23	34	48	29
34	26	48	31	37	29
49	47	43	41	33	44
35	37	38	35	20	30
32	24	39	39	37	48
40	44	39	32	29	27
34	36	27	46	28	43

Choose one class as 20.0 ï 24.9

Q.5 **(a)** A scientist want to determine the time to rotate a tyre of a car and he want to be able to assert with 95% confidence that the mean of his sample is off by at most 0.43 minute. If he can presume from past experience that $\sigma = 1.75$ minutes. Determine the sample size that he can take. **[07]**

(b) Test the null hypothesis $\mu \geq 3000$ with a level of significance 0.01. Given that the sample size is 50 and sample mean is 2799 and standard deviation is 297. **[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. **[07]**

(b) Test the null hypothesis $\mu = 450$ is against the alternative hypothesis $\mu > 450$ with a level of significance 0.05. Given that the sample size is 65 and sample mean is 470 and standard deviation is 37. **[07]**

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