Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER 2012

Subject code: 711403N Date: 12-01-2013

Subject Name: Statistical and Numerical Analysis

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)** Given the following data for the polynomial $f(x) = 3x^3 - 5x^2 + 4x + 1$. Compute $f(0.3)$ using Newton's divided difference formula. **07**

x	0	1	3	4	7
$f(x)$	1	3	49	129	813

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

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

Q.2 **(a)** Compute $\int_0^2 (1+x)\,dx$ by a gauss two point and three point formula. **07**

(b) Solve the following system of equation using partial pivoting by Gauss elimination method. **07**

$$8y + 2z = -7$$
$$3x + 5y + 2z = 8$$
$$6x + 2y + 8z = 26$$

OR

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

T	0	30	60	90	120	150	180
S	0	40	65	100	120	145	170

Find a law of the form S=a+bT and hence estimate S at time T=145.

Q.3 **(a)** Find the inverse of the following matrix by Gauss Jordan method **07**

$$\begin{bmatrix} 2 & 4 & 8 \\ 3 & 7 & 11 \\ 4 & 9 & 22 \end{bmatrix}$$

(b) Two fair dice are thrown together. Write the sample space. What is the probability that **07**

(i) sum of the faces is 6

(ii) sum of the faces is prime number

(iii) sum of the faces is divisible by 4.

OR

Q.3 **(a)** Evaluate the integral $\int_0^1 \left(4x - 3x^2\right) dx$ by taking $n = 10$ using **07**

(i) Trapezoidal rule,

(ii) Simpson's 1/3rd rule.

(b) A lottery sells ticket numbered from 1 to 500. what is the probability of drawing a number **07**

(i) divisible by 20

(ii) whose last digit is 5

(iii) Whose first digit is 2.

Q.4 **(a)** Define conditional probability. A company makes four types of gears out of which 30% A type, 45% B type and remaining C type. In A type 5% gears are defective, in B type 4% are defective and in C type 3% are defective. A gear is chosen at random and found to be defective what is the probability that it is of type B. **07**

(b) A management firm is preparing a project proposal. The cost of preparing the proposal is Rs.10000 and probability of making gross profit of Rs. 60000, Rs. 45000, Rs.15000 or Rs. 0 are 0.20, 0.50, 0.20 and 0.10 provided the project proposal is accepted. If the probability is 0.40 that the firm's proposal is accepted, what is its expected net profit? **07**

OR

Q.4 **(a)** If the probability is 0.20 that any one person will dislike the taste of a new tooth paste, what is the probability that **07**

(i) 5 of 18 randomly selected persons will dislike it?

(ii) 9 of 19 randomly selected persons will like it?

Q.4 **(b)** For the following data prepare a frequency distribution. Also prepare Histogram. **07**

86.7	52.6	77	79.8	62.8	86
44.3	64.9	40.3	47.5	30.4	32.2
73	39.8	81	67.6	41.7	80.3
75.2	70.3	73.9	66.6	69.7	81.8
41.9	60.7	43.7	74.7	70.3	64.4
33.6	39.5	75.9	40.6	37.2	35.5
60.2	50.4	78.9	30.6	61.3	77.1

Q.5 **(a)** A random sample of size 81 is taken from a population with $\sigma = 5.1$. Given that the sample mean is 21.6, construct a 95% confidence interval for the population mean μ. **07**

(b) Test the null hypothesis $\mu \geq 28000$ with a level of significance 0.01. Given that the sample size is 40 and sample mean is 27463 and standard deviation is 1348. **07**

OR

Q.5 **(a)** In six determinations of the melting point of tin, a chemist obtained a mean of 232.26 degrees Celsius with a standard deviation of 0.14 degrees. If he uses this mean to estimate the actual melting point of tin, what can the chemist assert with 98% confidence about the maximum error? **07**

(b) In 64 randomly selected hours of production, the mean and the standard deviation of the number of acceptable pieces produced by an automatic stamping machine are $\bar{x} = 1038$ and $s = 146$. At the 0.05 level of significance does this enable us to reject the null hypothesis $\mu = 1000$ against the alternative hypothesis $\mu > 1000$. **07**

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