Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2021

Subject Code:3130908 Date:06/09/2021

Subject Name:Applied Mathematics for Electrical Engineering

Time:10:30 AM TO 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. **Simple and non-programmable scientific calculators are allowed.**

Marks

Q.1 **(a)** Find a root of the equation $x^4 - x - 10 = 0$ correct to three decimal places, using the bisection method. **03**

(b) By Simpson's one-third rule, determine the area bounded by the given curve and X-axis between x = 25 to x =25.6 from the data given below. **04**

x	25	25.1	25.2	25.3	25.4	25.5	25.6
y	3.205	3.217	3.232	3.245	3.256	3.268	3.280

(c) Apply the method of least squares to determine the constants a and b such that $y = a\,e^{bx}$ fits the following data: **07**

X	0	0.5	1	1.5	2	2.5
Y	0.10	0.45	2.15	9.15	40.35	180.75

Q.2 **(a)** Define conditional probability. **03**

A bag contains 19 tickets numbered from 1 to 19. Two tickets are drawn successively without replacement. Find the probability that both tickets will show even number?

(b) The following are scores of two batsmen A and B in a series of innings: **04**

A:	12	115	6	73	7	19	119	36	84	29
B:	47	12	16	42	4	51	37	48	13	0

Who is the better score getter?

Who is more consistent?

(c) Discuss Newton-Rapshon method to solve non-linear equation $f(x) = 0$ numerically. Also, derive the formula to find the cube root of a positive number N and hence compute $\sqrt[3]{65}$. **07**

OR

(c) Discuss the fixed point iteration method. And using it find the real root of $x^3 - 5x + 3 = 0$ starting with $x_0 = 0.5$ correct to four decimal places. **07**

Q.3 **(a)** Evaluate $\int_{0.5}^{1.3} e^{x^2}\,dx$ by using Simpson's one-third rule taking h = 0.1. **03**

(b) Explain the method of least squares in brief. Use it to derive normal equations to fit a straight line $y = ax + b$. **04**

(c) Newton's interpolation formulas to find y at $x = 0.11$ and $x = 0.27$ from the data given below. **07**

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

OR

Q.3 **(a)** Evaluate $\int_{0}^{1} e^{-x^2}\,dx$ by 3-point Gaussian quadrature formula. **03**

(b) Define Central difference operator in terms of δ. **04**

Establish the operator relations $D = \frac{1}{h}\log(1+\Delta)$

(c) Write Newton's Divided difference interpolation formula for unequal intervals. Determine the interpolating polynomial of degree three by using Lagrange's interpolation for the following data. Also find f(2) **07**

x	– 1	0	1	3
$f(x)$	2	1	0	– 1

Q.4 **(a)** (i) State Baye's theorem. **03**
(ii) Define Bernoulli's trials.
(iii) Define independent events.

(b) Define probability density function. **04**
If the probability density function of a random variable is given by

$$f(x) = k\left(1-x^2\right), \text{ if } \quad 0 \le x \le 1$$
$$= 0 \qquad \text{, elsewhere}$$

Find the value of k and probability that X takes the value greater than 0.5

(c) What do you mean by predictor-corrector methods? State names of any three predictor-corrector methods. Apply Milne's predictor–corrector method to obtain $y(2)$ correct to three decimal places, if $y(x)$ is the solution of $\frac{dy}{dx} = \frac{1}{2}(x+y)$ where $y(0) = 2$, $y(0.5) = 2.636$, $y(1) = 3.595$, $y(1.5) = 4.968$ **07**

OR

Q.4 **(a)** Discuss Binomial probability. The probability a man aged 60 will live to be 70 is 0.65. What is the probability that out of 10 men aged 60 now, at least 7 would live to be 70? **03**

(b) Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the mean and variance of the number of kings. **04**

(c) Apply second order Runge-Kutta method to find an approximate value of $y(0.2)$ given that $\frac{dy}{dx} = x - y^2$, $y(0) = 1$ and $h = 0.1$. **07**

Q.5 **(a)** State any four known methods for finding skewness. **03**
Apply suitable method to compute the coefficient of skewness from the following figures:
25, 15, 23, 40, 27, 25, 23, 25, 20

(b) Let X has the probability density function **04**

$$f(x) = \frac{1}{2\sqrt{3}} \quad for\ -\sqrt{3} < x < \sqrt{3}$$
$$= 0 \qquad elsewhere$$

Find the actual probability $P\{|X-\mu| \ge \frac{3}{2}\sigma\}$ and compare it with the upper bound obtained by Chebyshev's inequality.

(c) Find kurtosis from the following data. **07**

Class interval	0–10	10–20	20–30	30–40
Frequency	1	4	3	2

OR

Q.5 **(a)** What do you mean by kurtosis? Illustrate the shape of three different curves on the basis of value of β_2. **03**

(b) A bag contains 6 white and 9 black balls. Four balls are drawn at a time. Find the probability for the first draw to give four white balls and second **04**

draw to give four black balls in each of the following case.

(i) with replacement and

(ii) without replacement

(c) Define r^{th} moment about mean for grouped data. From the following data, calculate moments about: (i) assumed mean and (ii) actual mean **07**

Variable	0–10	10–20	20–30	30–40
Frequency	1	3	4	2

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