GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–III EXAMINATION – WINTER 2025

Subject Code:3130908   **Date:31-12-2025**

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 positive root of the equation $x^3 - 4x - 9 = 0$ using bisection method in four steps.	**03**
	(b)	Find a real root of the equation $x^3 - x - 1 = 0$ by using false position method.	**04**
	(c)	Derive a formula to find reciprocal of a positive number N using Newton-Raphson method. Hence, find $\dfrac{1}{31}$ correct to three decimal places using Newton-Raphson method.	**07**

Q.2 **(a)** Given the following table of values of $f(x)$, find the values of $\nabla f(7), \nabla^2 f(9), \nabla^3 f(9)$.   **03**

x	1	3	5	7	9
$f(x)$	8	12	21	36	62

(b) Find the Newton's forward interpolation polynomial which takes the following values: $y(0) = 1, y(1) = 0, y(2) = 1$ and $y(3) = 10$. Also, find $y(4)$.   **04**

(c) Write Lagrange's interpolation formula for unequal intervals. Compute $f(9.2)$ using it and the following data.   **07**

x	9	9.5	11
$f(x)$	2.1972	2.2513	2.3979

OR

(c) Write Newton's divided interpolation formula. Compute $f(10.5)$ using it and the following data.   **07**

x	10	11	13	17
$f(x)$	2.3026	2.3979	2.5649	2.8332

Q.3 **(a)** Fit a straight line to the following data.   **03**

x	1	2	3	4	5
y	3	4	5	6	8

(b) Evaluate $\displaystyle\int_0^3 \frac{dx}{x+1}$ with $n = 6$ by using Simpson's 3/8 rule.   **04**

(c) Using Euler's method, find $\dfrac{dy}{dx} = y - \dfrac{2x}{y}, y(0) = 1$ (take $h = 0.1$).   **07**

OR

Q.3 **(a)** Fit a parabola to the following data.   **03**

x	1	2	3	4
y	6	11	18	27

(b) Using Taylor series method, find $y(0.1)$ correct to four decimal places, if $y(x)$ satisfies $y' = x - y^2$ and $y(0) = 1$.   **04**

(c) Apply Runge-Kutta method of fourth order to calculate $y(0.2)$ given that $y' = x + y, y(0) = 1$ taking $h = 0.1$ **07**

Q.4 **(a)** Four balls are to be drawn without replacement from a box containing 8 red and 4 white balls. If X denotes the number of red ball drawn, find the probability distribution of X.   **03**

(b) Is $f(x) = \dfrac{x}{6}; x = 0,1,2,3,4$ define probability distribution? Justify your answer.   **04**

(c) Three bags contain 3 red, 7 black; 8 red, 2 black, and 4 red and 6 black balls respectively. One of the bags is selected at random and a ball is drawn from it. If the ball drawn is red, find the probability that it is drawn from the third bag.   **07**

OR

Q.4 **(a)** A problem of Mathematics is given to three students A, B and C whose chances of solving it are 1/3, 1/4 and 1/2, respectively. What is the probability that the problem will be solved?   **03**

(b) Check whether the function defined by   **04**

$$f(x) = \dfrac{x}{6}; \quad -1 < x < 1$$
$$= 0; \quad \text{Otherwise}$$

is a probability density function?

(c) Define Conditional Probability. In a certain assembly plant, three machines B_1, B_2 and B_3 produces 30%, 45% and 25% of the products, respectively. It is known from past experience that 2%, 3% and 2% of the products made by each machine, respectively, are defective. Suppose that a finished product is randomly selected. What is the probability that it is defective?   **07**

Q.5 **(a)** Find the arithmetic mean by short-cut method for the following data.   **03**

x	0	1	2	3	4	5	6	7	8	9	10
f	2	8	43	133	207	260	213	120	54	9	1

(b) The probability distribution is given as below. Find expectation and variance.   **04**

x_i	5	6	7	8	9	10
p_i	0.05	0.10	0.30	0.40	0.10	0.05

(c) Find median for the following data.   **07**

x	0-10	10-20	20-30	30-40	40-50	50-60
f	12	18	27	20	17	6

OR

Q.5 **(a)** Calculate the average marks of the students by step deviation method for the following data.   **03**

Marks	0-10	10-20	20-30	30-40	40-50	40-60
No. of Students	40	41	55	30	21	16

(b) Determine the smallest value of k in the Chebyshev's inequality for which the probability is at least 0.95.   **04**

(c) Calculate mode for the following data.   **07**

x	0-100	100-200	200-300	300-400	400-500	500-600	600-700
f	10	20	25	25	37	19	19

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