GUJARAT TECHNOLOGICAL UNIVERSITY
BE(MINOR)- SEMESTER–I&II EXAMINATION – SUMMER 2025

Subject Code:N114AK01   **Date:03-06-2025**
Subject Name:Numerical Methods for Engineers using C
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)**	Define and explain Absolute Error and Relative Error.	**03**
	(b)	Derive General Error Formula for a function $u = f(x, y, z)$ assuming that the errors in x, y and z are $\Delta x, \Delta y$ and Δz.	**04**
	(c)	Explain Gauss Elimination for solution of a system of linear algebraic equations.	**07**
Q.2	**(a)**	Define the operators Δ, E and μ.	**03**
	(b)	Use iteration method to solve the equation $xe^x = 1$. It is given that the solution lies in the range [0 1].	**04**
	(c)	Explain LU Decomposition method for solution of a system of linear equations.	**07**

OR

	(c)	Find the cubic polynomial for $y(x)$ which takes the following values and thus find $y(8)$.	**07**

x	1	3	5	7
y	24	120	336	720

Q.3	**(a)**	Use Newton Raphson method to solve the non-linear equation $x^3 - 2x - 5 = 0$ taking $x_0 = 2$. Perform two iterations.	**03**
	(b)	Define Forward Difference, Backward Difference and Central Difference.	**04**
	(c)	Explain Simpson's $\frac{1}{3}$ rule and $\frac{3}{8}$ rule for numerical integration.	**07**

OR

Q.3	**(a)**	Explain the method to calculate $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ using Newton's Forward Difference formula.	**03**
	(b)	Explain Taylor's Series method of numerical integration.	**04**
	(c)	Evaluate $I = \int_0^1 \frac{1}{x+1} dx$, correct to three decimal places using (a) Trapezoidal Rule (b) Simpson's Rule Take $h = 0.5$ and $h = 0.25$	**07**
Q.4	**(a)**	Construct the Forward Difference Table for the following data.	**03**

x	1	2	3	4	5
$y=f(x)$	4	6	9	12	17

	(b)	Use Gauss's backward interpolation formula to find the sales for the year 1986 from the following data.	**04**

Year	1951	1961	1971	1981	1991	2001

Sales in Thousands	13	17	22	28	41	53

(c) Apply the Euler's method to solve the ordinary differential equation $\frac{dy}{dx} = x + y$ using increments of $h = 0.2$. It is given that $y = 1$ when $x = 0$. Carry out at least five steps. **07**

OR

Q.4 (a) Explain Modified Euler's method for solution of Ordinary Differential Equation. **03**

(b) Explain Runge-Kutta method of second order. **04**

(c) It is given that $\frac{dy}{dx} = y - x$ where $y(0) = 2$. Use fourth order Runge-Kutta method to find $y(0.1)$ and $y(0.2)$ **07**

Q.5 (a) Explain the concept of predictor-corrector methods for solution of ordinary differential equations. **03**

(b) Derive Adams-Bashforth formula for computation of predictor while solving an ordinary differential equation. **04**

(c) Explain finite difference method for solution of an ordinary differential method. **07**

OR

Q.5 (a) Write general form of a second order Partial Differential Equation and explain classification of the equation. **03**

(b) Discuss solution of a wave equation. **04**

(c) Discuss solution of Laplace's Equation and Leibmann's iterative method to improve accuracy. **07**

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