

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-III EXAMINATION – SUMMER 2025****Subject Code:3130908****Date:13-06-2025****Subject Name:Applied Mathematics for Electrical Engineering****Time:02:30 PM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

**Q.1 (a)** Prove that  $\Delta \left[ \frac{f(x)}{g(x)} \right] = \frac{g(x)\Delta f(x) - f(x)\Delta g(x)}{g(x+h)g(x)}$ . **03**

**(b)** Find the real root of the equation  $x^4 - x - 9 = 0$  by Newton Raphson method correct to three decimal places. **04**

**(c)** Three boxes of the same appearance have the following proportions of white and black balls: Box I contains 1 white and 2 black, Box II contains 2 white and 1 black. Box III contains 2 white and 2 black. One of the boxes is selected at random and one ball is drawn randomly from it. It turns out to be white. What is the probability that the third box is chosen? **07**

**Q.2 (a)** There are 5 white and 7 red balls in a bag. A ball is drawn and then replaced. What is the probability that a white and a red ball are drawn in that order? What would be the probability if the balls drawn were not put in the bag? **03**

**(b)** By the method of least square, find the straight line that best fits the following data: **04**

x	1	2	3	4	5
y	14	27	40	55	68

**(c)** Find a polynomial which takes the following values **07**

x	1	3	5	7	9	11
y	3	14	19	21	23	28

and hence compute y at x = 2, 12.

OR

**(c)** Fit a second degree parabola to the following data using least squares. **07**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

**Q.3 (a)** Evaluate  $\int_0^{10} \frac{dx}{1+x^2}$  by using Trapezoidal rule. **03**

**(b)** Let X be a continuous random variable with probability density function  $f(x) = kx(1-x), 0 \leq x \leq 1$ , Find k and determine a number b such that  $P(X \leq b) = P(X \geq b)$ . **04**

**(c)** Using Taylor's series method find y at x = 1.1 and 1.2 by solving  $\frac{dy}{dx} = x^2 + y^2$ , given  $y(1) = 2.3$ . **07**

OR

- Q.3 (a)** In a school 85 boys and 35 girls appeared in a public examination. The mean marks of boys was found to be 40 %, where as the mean marks of girls was 60%. Determine the average marks percentage of the school. **03**

- (b)** Use Lagrange's formula to find the form of  $f(x)$ , given: **04**

x	0	2	3	6
f(x)	648	704	729	792

- (c)** Evaluate  $\int_1^2 \frac{2x dx}{1+x^4}$ , using 3-point Gauss quadrature formula and compare with the actual value. **07**

- Q.4 (a)** Find the first four moments for the set of number 2, 4, 6, 8. **03**

- (b)** Find a polynomial satisfied by the following table: **04**

x	-4	-1	0	2	5
f(x)	1245	33	5	9	1335

- (c)** Using Runge-Kutta method of fourth order, solve for  $y(0.1)$ ,  $y(0.2)$  and  $y(0.3)$  given that  $y' = xy + y^2$ ,  $y(0) = 1$ . **07**

OR

- Q.4 (a)** The marks obtained by 10 students in an examination were as follows: 70, 65, 68, 70, 75, 73, 80, 70, 83, 86. Find the mode, median and mean deviation about the mean. **03**

- (b)** Using Euler's method, solve  $\frac{dy}{dx} = 1 - y$ ,  $y(0) = 0$  in the range  $0 \leq x \leq 0.3$ . **04**

- (c)** The joint probability density function of two random variables is given by **07**

$$f(x, y) = 15e^{-3x-5y}, \quad x > 0, y > 0$$

$$= 0, \quad \text{otherwise}$$

Find (i)  $P(1 < X < 2, 0.2 < Y < 0.3)$  (ii)  $P(X < 2, Y > 0.2)$ .

- Q.5 (a)** Prove that  $(1 + \Delta)(1 - \nabla) = 1$ . **03**

- (b)** Use Picard's method to approximate the value of  $y$  when  $x = 0.1$  given that  $y = 1$  when  $x = 0$  and  $\frac{dy}{dx} = \frac{y-x}{y+x}$ . **04**

- (c)** Solve for a positive root of  $x - \cos x = 0$  by regula falsi method correct to three decimal places. **07**

OR

- Q.5 (a)** Two cards are drawn from a pack of cards. Find the probability that they will be both red or both pictures. **03**

- (b)** Compute  $\int_4^{5.2} \log_e x dx$  by using Simpson's 3/8 rule. **04**

- (c)** Calculate Karl Pearson's coefficient of skewness from the following data: **07**

Wages (Rs.)	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
No. of workers	8	16	30	45	62	32	15	6

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