

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER– III EXAMINATION – SUMMER 2026

Subject Code:3130908

Date:03-07-2026

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) Derive the Newton-Raphson's iteration formula.

(b) Evaluate $\int_0^9 \frac{dx}{1+x^3}$ correct to four decimal places by Simpson's $\frac{3}{8}$ rule. Take $h = 1$.

(c) Find a real root of the equation $x^3 - 2x - 5 = 0$ by the method of false position correct to three decimal places.

Q.2 (a) A bag contains 8 white and 6 red balls. Find the probability of drawing two balls of the same colour.

(b) Using the method of least squares, find the straight line $y = ax + b$, that fits the following data:

x :	0.5	1.0	1.5	2.0	2.5	3.0
y :	15	17	19	14	10	7

(c) Using Runge-Kutta method of fourth order compute $y(0.2)$ from $10 \frac{dy}{dx} = x^2 + y^2, y(0) = 1$, take $h = 0.1$.

OR

(c) Find by Taylor's series method the value of y at $x = 0.1$ and $x = 0.2$ from $\frac{dy}{dx} = x^2y - 1, y(0) = 1$.

Q.3 (a) Write the normal equations to fit the curve $y = ax^b$.

(b) X is continuous random variable with probability density function given by $f(x) = \begin{cases} kx; & 0 \leq x < 2 \\ 2k; & 2 \leq x < 4 \\ -kx + 6k; & 4 \leq x < 6 \end{cases}$. Find k .

(c) Find the cubic polynomial which takes the following values by Newton forward interpolation:

x :	0	1	2	3
$f(x)$:	1	2	1	10

Hence evaluate $f(4)$.

OR

Q.3 (a) Write the normal equations to a fit parabola $y = ax^2 + bx + c$.

(b) Calculate the mean and standard deviation for the following :

Size of item:	6	7	8	9	10	11	12
Frequency:	3	6	9	13	8	5	4

Marks

03

04

07

03

04

07

07

03

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03

04

- (c) Find the interpolating polynomial by Langrange's formula for the data: 07
- | | | | | |
|------|---|---|---|---|
| $x:$ | 0 | 1 | 2 | 4 |
| $y:$ | 1 | 1 | 2 | 5 |
- Q.4** (a) Evaluate $\int_{1.0}^{1.8} \frac{e^x + e^{-x}}{2} dx$ using Simpson's $\frac{1}{3}$ rule by taking $h = 0.2$. 03
- (b) The probability density function of a variate X is 04
- | | | | | | | | |
|---------|-----|------|------|------|------|-------|-------|
| $X:$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| $P(X):$ | k | $3k$ | $5k$ | $7k$ | $9k$ | $11k$ | $13k$ |
- (i) Find $P(X < 4)$
- (ii) Find $P(3 < X < 6)$
- (c) The probability that a pen manufactured by a company will be defective is $\frac{1}{10}$. If 12 such pens are manufactured, find the probability that (i) exactly two will be defective (ii) at least two will be defective (iii) none will be defective. 07
- OR**
- Q.4** (a) Given $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$ and $P(A \cup B) = \frac{1}{2}$, evaluate $P(A/B)$, $P(A \cap B')$ and $P(A/B')$. 03
- (b) Show that $\Delta = E\nabla = \nabla E$. 04
- (c) A factory has three machines, X, Y and Z, producing 1000, 2000 and 3000 bolts per day respectively. The machine X produces 1% defective bolts, Y produces 1.5% and Z produces 2% defective bolts. At the end of the day, a bolt is drawn at random and it is found to be defective. What is the probability that this defective bolt has been produced by the machine X? 07
- Q.5** (a) Two cards are drawn in succession from a pack of 52 cards. Find the chance that the first is a king and the second a queen if the first card is (i) replaced, (ii) not replaced. 03
- (b) Evaluate $\Delta^n(e^x)$. 04
- (c) Find out the kurtosis of the data: 07
- | | | | | |
|-----------------|------|-------|-------|-------|
| Class interval: | 0-10 | 10-20 | 20-30 | 30-40 |
| Frequency: | 1 | 4 | 3 | 2 |
- OR**
- Q.5** (a) A pair of dice is tossed twice. Find the probability of sum of scoring 7 points (a) once, (b) at least once, (c) twice. 03
- (b) Calculate the first four moments of the following distribution about the mean. 04
- | | | | | | | | | | |
|------|---|---|----|----|----|----|----|---|---|
| $x:$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| $f:$ | 1 | 8 | 28 | 56 | 70 | 56 | 28 | 8 | 1 |
- (c) Calculate Karl Pearson's co-efficient of skewness from the data: 07
- | | | | | | |
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| Income (Rs.): | 400-500 | 500-600 | 600-700 | 700-800 | 800-900 |
| Number of employees: | 8 | 16 | 20 | 17 | 3 |
