

Seat No./Enrollment No.: \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BACHELOR OF ENGINEERING – SEMESTER 4 – EXAMINATION – SUMMER 2026**

Subject Code: 3144007

Date: 30/05/2026

Subject Name: Numerical and Statistical Methods

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.

**Q.1** (a) Define probability. **03**

A bag contains 12 green, 35 red, and 50 blue beads. A bead is drawn randomly. Find the probability that the drawn bead is blue.

(b) Using curve fitting technique, find a straight line  $y=a+bx$  to the following data. **04**

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| x | 5 | 4 | 3 | 2 | 1 |
| y | 1 | 2 | 3 | 4 | 5 |

(c) Perform 4 iterations to find the real root of the equation  $2x^3-2x-5=0$  between 1 and 2 using bisection method. **07**

**Q.2** (a) Calculate the arithmetic mean of the following grouped data. **03**

|           |       |       |       |        |
|-----------|-------|-------|-------|--------|
| Class     | 2 - 4 | 4 - 6 | 6 - 8 | 8 - 10 |
| Frequency | 3     | 4     | 2     | 1      |

(b) Calculate mode from the following grouped data **04**

|           |     |       |       |       |        |       |
|-----------|-----|-------|-------|-------|--------|-------|
| Class     | 0-2 | 2 - 4 | 4 - 6 | 6 - 8 | 8 - 10 | 10-12 |
| Frequency | 5   | 16    | 13    | 7     | 5      | 4     |

(c) Find  $y(0.1)$  for  $y'=-y$ ,  $x_0=0$ ,  $y_0=1$ , with step length 0.1 using Runge-Kutta 4 method. **07**

OR

**Q.2** (c) Using Simpson's 3/8th rule, integrate  $f(x)=1/x$ , in interval  $[1,2]$  using  $h=0.25$  **07**

**Q.3** (a) Calculate correlation coefficient from the following data **03**

|   |   |   |   |   |
|---|---|---|---|---|
| A | 3 | 5 | 7 | 9 |
| B | 3 | 4 | 2 | 1 |

(b) Find  $f(1895)$  using Newton's Forward Difference formula **04**

|      |      |
|------|------|
| x    | f(x) |
| 1891 | 46   |
| 1901 | 66   |
| 1911 | 81   |
| 1921 | 93   |
| 1931 | 101  |

(c) Find the regression line equations for y on x using the following data. **07**

|   |    |    |    |    |
|---|----|----|----|----|
| X | 3  | 5  | 7  | 9  |
| Y | 30 | 41 | 29 | 15 |

OR

**Q.3** (a) Calculate Median from the following grouped data. **03**

| Class   | Frequency |
|---------|-----------|
| 0 - 2   | 5         |
| 2 - 4   | 16        |
| 4 - 6   | 13        |
| 6 - 8   | 7         |
| 8 - 10  | 5         |
| 10 - 12 | 4         |

(b) Find  $f(301)$  using Lagrange's Interpolation formula **04**

| x   | f(x)   |
|-----|--------|
| 300 | 2.4771 |
| 304 | 2.4829 |
| 305 | 2.4843 |
| 307 | 2.4871 |

(c) Find an estimate of the variance and standard deviation of the following data for the marks obtained in a test by 88 students. **07**

| Class     | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 |
|-----------|------|-------|-------|-------|-------|
| Frequency | 6    | 16    | 24    | 25    | 17    |

**Q.4** (a) State Baye's theorem. **03**

(b) Write any two properties of binomial distribution. **04**

(c) Explain the difference between normal and Poisson distribution. **07**

OR

**Q.4** (a) A random variable X has the probability mass function given by **03**

| X      | 1 | 2   | 3   | 4   |
|--------|---|-----|-----|-----|
| P(X=x) | 0 | 0.3 | 0.6 | 0.1 |

Find (i)  $P(2 \leq X \leq 4)$  (ii)  $P(X > 2)$ , (iii)  $P(X \text{ is even})$ .

(b) Suppose a fair coin is tossed three times. **04**

i) What is the probability of getting three heads, HHH?

ii) What is the probability to get exactly one heads?

iii) Given that you have observed at least one heads, what is the probability that you observe at least two heads?

(c) Let X is a normal random variable with  $\mu = -5$  and  $\sigma = 2$ . **07**

i) Find  $P(X < 0)$ .

ii) Find  $P(-7 < X < -3)$ .

**Q.5** (a) A study states that the average height of adult males in a particular city is greater than **03**

70 inches. They collect a random sample of 100 adult males from the city and find that the sample mean height is 70.8 inches, with a known population standard deviation of 2.5 inches. Test the claim at a significance level of 0.05%.

- (b) A marketing team wants to know if there's a relationship between the color of a product and its sales. They offer the product in three colors: Red, Blue, and Green. After a month, they collect the following data:

| Color        | Number Sold |
|--------------|-------------|
| Red          | 50          |
| Blue         | 30          |
| Green        | 20          |
| <b>Total</b> | <b>100</b>  |

The team wants to know if the color affects sales or if the differences in sales are just due to random chance. They set a significance level of 0.05.

- (c) Explain with any example the application of t-test.

OR

- Q.5** (a) A coin was tossed 100 times and heads turned up 60 times. Test the hypothesis that the coin is biased at 1% level of significance **03**
- (b) A teacher wants to know if the variability in test scores is different for two teaching methods. They collect data from two classrooms: Class 1 (Method A): Sample size 25, Sample variance 100, and Class 2 (Method B): Sample size 31, Sample variance 60. Test the hypothesis that the variances are equal at a significance level of 0.05. **04**
- (c) A researcher wants to test if the average height of adult women in a certain city is different from 64 inches. She takes a random sample of 25 women from the city and finds that the sample mean height is 66 inches, with a sample standard deviation of 5 inches. Perform a hypothesis test at a significance level of 1%. **07**

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