

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV EXAMINATION – SUMMER 2025****Subject Code:3144007****Date:19-05-2025****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) A coin is thrown 3 times, what is the probability that at least one head is obtained? **03**

(b) A class consists of 50 students, out of which 30 are girls. The mean of marks scored by girls in a test is 73 and that of boys is 71. Determine the mean score of the whole class. **04**

(c) Find the root of the following polynomial function using the bisection method: $x^3 - 4 = 0$ **07**

Q.2 (a) Let E and F are events of an experiment such that $P(E) = 3/10$, $P(F) = 1/2$ and $P(F|E) = 2/5$. Calculate $P(E \cap F)$ and $P(E \cup F)$. **03**

(b) Use Trapezoidal rule to approximate $\int_1^2 \frac{dx}{x}$ taking $h = 0.25$. **04**

(c) Calculate the correlation coefficient: **07**

x	50	51	52	53	54
y	3.1	3.2	3.3	3.4	3.5

OR

(c) Find $f(1895)$ using Newton's forward difference formula **07**

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

Q.3 (a) The following data are the weights of students in a class. Find the median weights of the students **03**

Weight	10	20	30	40	50	60	70
No of students	4	7	12	15	13	5	4

(b) Find the positive root of the equation $x - \cos x = 0$ using Regula Falsi method and correct to 2 decimal places. **04**

(c) A coin is tossed 12 times. Using a suitable distribution find the probability of getting exactly 7 heads. **07**

OR

Q.3 (a) For any given data, the mean is 45.5, and the median is 43. Find the modal value. **03**

(b) In an art competition, two judges gave the following ranks to the 10 participants. Calculate the rank correlation coefficient. **04**

Judge X	1	2	3	4	5	6	7	8	9	10
Judge Y	6	2	9	7	1	4	8	3	10	5

- (c) The average number of students to attend a lecture is 3. Using Poisson distribution, find the probability that exactly 4 students will attend the lecture. **07**

- Q.4** (a) The population of all verbal GRE scores are known to have a standard deviation of 8.5. This year, the mean verbal GRE scores for the 42 applicants was 212.79. Using a value of $\alpha = 0.05$ is this new mean significantly greater than the desired mean of 210? (Given that $z_{0.05} = 1.645$) **03**

- (b) Fit a straight line from the given data: **04**

X	1	2	3	4	5
Y	5	4	3	2	1

- (c) Find $y(0.1)$ for $\frac{dy}{dx} = y$, $y(0) = 1$, with step length 0.1 using Taylor Series method. **07**

OR

- Q.4** (a) The sample correlation based on $n = 170$ couples is $r = 0.939$. Does this data show significant difference in the population correlation coefficient. Test at 5% significant level. (Given $1.96 < t_{0.05} < 1.98$) **03**

- (b) The coefficients of variations of two distributions are 55 and 65 and their standard deviations are 22 and 39 respectively. Find the arithmetic means of the two distributions. **04**

- (c) Use Runge-Kutta method of order four to evaluate $y(0.1)$ from the differential equation $\frac{dy}{dx} = y - x$, $y(0) = 2$ and step size = 0.1 (up to three decimal places). **07**

- Q.5** (a) Conduct F-test at 5% significant level for the following data: (Given that $F_{0.05} = 2.2$) **03**

	Sample 1	Sample 2
Standard deviation	10.47	8.12
size	16	21

- (b) A discrete random variable X has the following probability mass function. Evaluate the value of k. **04**

X	1	2	3	4
P (X = x)	k	2k	3k	4k

- (c) A child psychologist believes that children perform better on tests when they are given perceived freedom of choice. To test this belief, the psychologist carried out an experiment and the performance of each child was rated. Test at the 5% level of significance, whether there is sufficient evidence in the data to support the psychologist's belief. **07**

	No freedom of choice	Freedom of choice
Very Good	32	29
Good	55	61
Fair	10	13

(Given that $\chi^2_{0.05} = 5.99$)

OR

- Q.5 (a)** Is there a significant difference in test scores between 26 students who received in-person instruction and 26 students who received online instruction? The mean test score for the in-person group is 80 (SD = 5) and for the online group is 75 (SD = 7). (Test at 5% significance level) (Given that $t_{0.05} = 2.009$) **03**
- (b)** A continuous random variable X has the following density function: **04**

$$f(x) = kx, \quad 0 \leq x \leq 10$$

 Evaluate k.
- (c)** A dice is tossed 120 times with the following results. Test at 5% significant level the hypothesis that the dice is unbiased. (Given that $\chi^2_{0.05} = 11.07$) **07**

No.	1	2	3	4	5	6
Frequency	30	25	18	10	22	15
