Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2023 - 24 Examination

Semester: 4/8 **Date: 01/05/2024**

Subject Code: 203191254 **Time: 2:00pm to 4:30pm**

Subject Name: Probability, statistics and numerical methods **Total Marks: 60**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1	**Objective Type Questions** - (Fill in the blanks, one word answer, MCQ- not more than Five in case of MCQ) (All are compulsory) (Each of one mark)	**(15)**	**CO**	**PO**	**Bloom's Taxonomy**
	1.V(2024) =_____. A) 0 B) 2024 C) 1 D) None of these		**2**	**2**	**Understanding**
	2.What is the possible sample size for Z-test? A) 50 B) 20 C) 28 D) None of these		**3**	**1**	**Understanding**
	3.$(1+\Delta)(1-\nabla) =$ _____. A) 1 B) -1 C) 3 D) None of these		**1**	**1**	**Understanding**
	4. $y_{n+1} = y_n + hf(x_n, y_n)$ is known as A) Euler's formula B) Taylor's formula C) Langrage formula. D). None of these		**1**	**1**	**Remembering**
	5.Which of the following methods are iterative methods? A) Bisection method B) Newton–Raphson method C) Regula Falsi method D) All of the above		**1**	**2**	**Remembering**
	6. Define: Type-II Error.		**3**	**2**	**Remembering**
	7. The correlation coefficient is independent of change of origin and scale (True/False)		**3**	**1**	**Knowledge**
	8.If Null hypothesis is accepted then alternative hypothesis is also accepted (True/False).		**3**	**2**	**Understanding**
	9. If the ratio of change between two variables is constant, the correlation is said to be linear. (True/False)		**3**	**1**	**Understanding**
	10. T-test is an iterative method. (True/False)		**3**	**1**	**Understanding**
	11. The correlation coefficient lies between _____ to _____.		**1**	**2**	**Knowledge**
	12. Define: Conditional probability		**2**	**1**	**Remembering**
	13.For Binomial distribution, if $n = 4, p = \frac{2}{3}$ then variance =_____.		**2**	**2**	**Application**
	14.Define: Regression coefficients. (x *on* y)		**3**	**2**	**Remembering**
	15.Write down trapezoidal formula.		**1**	**1**	**Remembering**
Q.2	**Answer the following questions**. (Attempt any three)	**(15)**			
	A) Find the value of y when $x = 10$ from the following table by using Lagrange's interpolation formula.	**5**	**1**	**2**	**Application**

x	5	6	9	11
y	12	13	14	16

B) Obtain the rank correlation coefficient from the following data. **5 1 1 Application**

x	10	12	18	18	15	40
y	12	18	25	25	50	25

C) Evaluate $\int_0^3 \frac{1}{1+x} dx$ with $n = 6$ by using Simpson's 3/8 rule and, hence, calculate log 2. **5 1 1 Application**

D) In a pharmaceutical factory, machines A and B manufacture 40% and 60% of the total output. Of this production of tablets, machines A and B produce 5% and 10% defective tablets. A tablet is picked at random and is found to be defective. What is the probability that the tablet was produced by the machine A? **5 2 Application**

Q.3 A) Using Newton's forward interpolation formula, find the value of $f(218)$. **(07) 1 2 Understanding**

x	100	150	200	250	300	350	400
y	10.63	13.03	15.04	16.81	18.42	19.90	21.27

B) Each 4 marks. **(08) 2 1 Application**

1. A stenographer claims that he can write at an average speed of 120 words per minute. In 100 trials he obtained an average speed of 116 words per minute with a standard deviation of 15 words. Is the claim justified? Use 5% level of significance. (Z=1.96)

2. The variate X has a Poisson distribution and is given that P(X = 2) = 0.25 and P(X =3) = 0.125 Find P(X = 0) ,P(X = 1) and P(X< 3).

OR

B) Each 4 marks. **(08) 1 1 Application**

1. Find a root of $x^3 - 4x - 9 = 0$ by the bisection method in four stages.

2. Given that y = 1.3 when x = 1 and $\frac{dy}{dx} = 3x + y$. Use the second-order Runge–Kutta method to approximate y when$x = 1.2$. Use a step size of 0.1

Q.4 A) In a certain sample of 2000 families,1400 families are consumers of Tea. Out of 1800 Indian families 1236 families consume Tea. Use Chi-Square test and state whether there is any significant difference between consumption of Tea among Indian and Non-Indian families. **(07) 2 1 Application**

(Use χ^2_{tab}=3.84)

OR

A) Solve the following system of equations by Gauss Jacobi method **(07) 1 2 Application**

$$6x + 2y - z = 4$$
$$x + 5y + z = 3$$
$$2x + y + 4z = 27$$

B) **(08) 3 1 Understanding**

Fit a straight line to the following data and hence find y when x=70

x	71	68	73	69	67	65	66	67
y	69	72	70	70	68	67	68	64