PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B. Tech Mid Semester Exam

Semester:4ᵗʰ Sem   Date:(01/02/2024)
Subject Code: (303191251)   Time: (1hr: 30min)
Subject Name: (PROBABILITY, STATISTICS AND NUMERICAL METHODS)   Total Marks: 40

Sr. No.		Marks
Q.1	(A) Five One-line Questions.	05

1. Define Mutually exclusive events.

2. Write down the formula of Karl Pearson's Coefficient of Correlation.

3. For two correlated variables x and y if $n = 5, x = 3, y = 4, x^2 = 9, xy = 6, y^2 = 5$ then what is the coefficient of regression of y on x?

4. Write down the formula of Multiplication Theorem.

5. Write down the formula of Standard Normal Density Function.

(B) Five Fill in the blanks.   05

1. The Coefficient of Correlation Lies Between _____ And _____ .

2. If the ratio of change between two variables is constant, the correlation is said to be _____ .

3. Write down two iterative method.

4. Spearman's rank correlation coefficient is independent of change of _____ and dependent on change of _____ .

5. Two outcomes are possible on each trial. We refer to one outcome as a success and the other outcome as a _____ .

Q.2   **Attempt any four (Short Questions)**   12
(1) Find the five iterations of $x^3 + x - 1 = 0$ by Bisection method.
(2) Calculate the correlation coefficient between the following data

x	5	9	13	17	21
y	12	20	25	33	35

(3) A department store has been the target of many shoplifters during the past month, but owing to increased security precautions, 250 shoplifters have been caught. Each shoplifter's sex is noted, also noted is whether he/she was a first-time or repeat offender. The data are summarized in the table below.

Age (Year)	Bachelor's Degree only	Master's Degree	Total
Under 30	90	10	100
30 to 40	20	30	50
Over 40	40	10	50
Total	150	50	200

(4) Ten students got the following percentage of marks in mathematics and physics.

(x) math's	8	36	98	25	75	82	92	62	65	35
(y) physics	84	51	91	60	68	62	86	58	35	49

Find the rank correlation coefficient.

(5) Three unbiased coins are tossed together. Find probability getting

(a) Exactly 2 heads

(b) At least one tail

(c) Exactly two heads in succession.

Q.3 Attempt any two questions   08

(1) Fit a straight line to the following data:

x	1	2	3	4	6	8
y	2.4	3	3.6	4	5	6

(2) Students at Nirma Institute of Technology spend average of 24.3 hours per week on homework, with a standard deviation of 1.4 hours. (a) What percentage of students spend more than 28 hours per week on homework? (b) What is the probability that a student spends more than 28 hours per week on homework.

(3) Solve the following system of equations:

$$8x - y + 2z = 13$$
$$x - 10y + 3z = 17$$
$$3x + 2y + 12z = 25$$

Q.4 (A) In a railway reservation office, two clerks are engaged in checking reservation   05
forms. On an average the clerk A checks 55% of the forms, while the clerk B does
the remaining work. The clerk A has an error rate of 0.03 and the clerk B has an error
rate of 0.02. A reservation form is selected at random from the total number of forms
checked during a day and discovered to have an error. Find the probabilities that it
was checked by the clerks A and B respectively.

(B) Find the root of the equation $2x - log10x = 7$, which lies between 3.5 and 4,   05
correct up to five places of decimal.

<div align="center">OR</div>

(B) Find a root of $x^4 - x^3 + 10x + 7 = 0$, correct up to three decimal places   05
between −2 and −1 by the Newton–Raphson method.

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