

2026

STATISTICS — MDC

Paper : CC-2

(Descriptive Statistics - II and Probability - II)

Full Marks : 75

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer **any five** questions : 2×5

- (a) If the regression line of x on y and that of y on x coincide, determine the value of the correlation coefficient between x and y .
- (b) Write down the formula of Kendall's rank correlation coefficient. Write down the limits of this measure.
- (c) Define independence of two attributes A and B .
- (d) Suppose a random variable X follows a Poisson distribution with mean 5. Find $P[X=0]$.
- (e) Write down the probability density function for a standard normal distribution.
- (f) If $b_{xy} = -1.8$ and $b_{yx} = -0.2$, then find the correlation coefficient between x and y .
- (g) What do you mean by a discrete random variable?
- (h) Write down the properties of probability mass function of a random variable X .

2. Answer **any four** questions : 5×4

- (a) What do you mean by cumulative distribution function (C.D.F.) of a random variable X ? Write down its properties.
- (b) What do you mean by intraclass correlation? How do we measure it?
- (c) Write down the probability mass function (P.M.F.) of a random variable X following a discrete uniform distribution over $\{1, 2, \dots, N\}$. Find its mean and variance.
- (d) Derive mode for a Normal Distribution with mean μ and variance σ^2 .
- (e) Write a short note on scatter diagram.
- (f) For what value of a ,

$$f(x) = \begin{cases} a \left(\frac{1}{2} \right)^x, & x = 0, 1, 2, \dots \\ 0, & \text{otherwise} \end{cases}$$

is the probability mass function of a random variable X ? Find $P(X > 0 \mid X < 2)$.

Please Turn Over

(7600)

3. Answer **any three** questions :

- (a) (i) A continuous random variable X has a density function given by

$$f(x) = \begin{cases} \frac{1}{2} - ax, & 0 \leq x \leq 4 \\ 0, & \text{otherwise,} \end{cases}$$

where 'a' is a constant.

Find (A) the value of 'a', (B) $P(1 < X < 2)$, (C) $P(2X + 3 > 5)$ and (D) $E(X)$.

- (ii) Suppose probability mass function (P.M.F.) of a discrete random variable Y is

$$P[Y = y] = \begin{cases} \frac{1}{3}, & \text{if } y = 0, 1, 2 \\ 0, & \text{otherwise.} \end{cases}$$

Find the mean and variance of y .

(3+3+3+2)+4

- (b) Derive Spearman's rank correlation coefficient when there are no ties. Prove that it lies between -1 and +1. Discuss the boundary cases. 7+6+2

- (c) (i) If the correlation coefficient between two variables x and y is 0, does it imply that the two variables are not related? Justify.

- (ii) Explain the concept of correlation ratio.

- (iii) What do you mean by a 2×2 contingency table? Explain the concept of association of two attributes for this table. 5+5+5

- (d) (i) Derive the mean and variance of Binomial (n, p) distribution.

- (ii) Give one real life example of Poisson distribution. For a random variable $X \sim \text{Poisson}(\lambda)$, find the mode of X . 8+(1+6)

- (e) (i) For a random variable $X \sim N(\mu, \sigma^2)$, show that $E(|X - \mu|) = \sqrt{\frac{2}{\pi}} \sigma$.

- (ii) For $X \sim N(\mu, \sigma^2)$, find $P(-\mu < X < \mu \mid -\mu < X < 3\mu)$.

- (iii) Check whether the following is a probability density function or not :

$$f(x) = \frac{5}{\sqrt{\pi}} e^{-25x^2}, -\infty < x < \infty.$$

7+5+3