

2026

STATISTICS — MINOR

Paper : MN-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** of the following questions : 2×5
 - (a) What do you mean by bivariate data?
 - (b) What is cumulative distribution function (c.d.f.) of a random variable?
 - (c) If a random variable X assumes only two values -1 and 1 such that $2P(X = 1) = P(X = -1)$, find $E(1 \times 1)$.
 - (d) Given a c.d.f. $F(x)$ of a random variable X , determine c.d.f. of $Y = -X$.
 - (e) If correlation coefficient between X and Y is zero, find $V(aX - bY)$.
 - (f) If $2x + 3y = 7$, determine the correlation coefficient between x and y .
 - (g) For what value of k , $f(x) = k(x - 1)$, $x = 0, 1, 2, \dots, 10$ is the probability mass function of a random variable X ?
 - (h) If $4U = 2x + 7$, $6V = 2y - 15$ and the regression coefficient of y on x is 3 , find the regression coefficient of V on u .
2. Answer **any four** questions from the following : 5×4
 - (a) Explain the idea of a random variable and its probability distribution with an example. Also find its expectation.
 - (b) What is scatter diagram? Discuss different types of correlation with this diagram.
 - (c) Define product moment correlation coefficient. Derive the range of this measure.
 - (d) If X_1, X_2, X_3 are uncorrelated variables, each having the same standard deviation, obtain the correlation coefficient between $X_1 + X_2$ and $X_2 + X_3$.
 - (e) Define uniform (discrete) distribution. Find its mean and variance.
 - (f) For what value of 'a' will $f(x)$ be the probability mass function of a discrete random variable X where $f(x) = ax$ ($x = 1, 2, \dots, n$)? Find $P(X > 2)$, mean and variance of X .

Please Turn Over

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3. Answer **any three** questions from the following :

- (a) (i) What do you mean by regression of a variable x on another variable y ? How will you determine it on the basis of n pairs of values of x and y ?
 (ii) If X and Y are two correlated variables with same variance and correlation coefficient r , find the regression coefficient of x on $(x + y)$ and that of $(x + y)$ on x . Hence find the correlation coefficient between x and $(x + y)$. 8+7
- (b) (i) Explain the meaning of coefficient of determination r^2 in the context of linear regression. What is r_p^2 (in case of p th degree polynomial)? Show that $r_{p-1}^2 \leq r_p^2$.
 (ii) Two regression lines are given as $7x - 3y - 36 = 0$ and $4x - y + 8 = 0$. Which of these is the regression equation of x on y and which is the regression equation of y on x ?
 (iii) Discuss Kendall's rank correlation when there is no tie. (2+2+4)+3+4
- (c) (i) Define probability mass function and probability density function.
 (ii) Let $f(x) = \theta \cdot e^{-\theta x}$, $\theta > 0$ $x > 0$.
 Check whether it is a proper p.d.f. or not.
 Hence find $E(X)$ and $V(X)$.
 (iii) Discuss the characteristics of Binomial Distribution. 4+6+5
- (d) (i) Show the effect of change of origin and scale on correlation coefficient.
 (ii) In a contingency table, define independence of the attributes.
 (iii) For a r.v. X , show that $E\left(X^2\right)^{\frac{1}{2}} \geq E(X)$.
 (iv) Determine the value of 'c' such that $f(x) = c(x - 2)(3 - x)$, $2 \leq x \leq 3$, may represent a p.d.f. Find the c.d.f. 4+5+2+4
- (e) (i) Find the mean and variance of a Normal distribution with parameters μ and σ^2 .
 (ii) For what value of p variance of binomial distribution with parameters n and p will be maximum?
 (iii) What do you mean by correlation ratio?
 (iv) Show that Normal distribution is a symmetric distribution. 6+3+3+3
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