

2025

STATISTICS — MDC

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** questions : 2×5

- (a) What is scatter diagram in bivariate data?
- (b) What do you mean by regression?
- (c) What is rank correlation?
- (d) If correlation coefficient between two variables is zero, what can you say about their relationship?
- (e) Define a continuous random variable with one example.
- (f) State the conditions under which a function $f(x)$ becomes a probability mass function (p.m.f.).
- (g) The p.d.f. of a random variable X is given by

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

Find $E(X)$.

- (h) Verify the statement : 'The mean and variance of a Binomial variable are $\frac{11}{3}$ and $\frac{25}{9}$, respectively.'

2. Answer **any four** questions :

- (a) Prove that Pearson's product moment correlation coefficient (r) lies between -1 and $+1$. When will it take the values -1 and $+1$? 5
- (b) If the two regression lines are $3x + 12y = 19$ and $3y + 9x = 46$, determine which one of these is the regression line of y on x . Obtain the angle between these two regression lines. 3+2
- (c) What do you mean by association between two categorical variables? Discuss one such measure. 5
- (d) The p.m.f. $f(x)$ of a random variable X is zero except at the points $x = 0, 1, 2$ and $f(0) = c, f(1) = 2c, f(2) = 4c$. Determine the value of c and find the variance of X . 5
- (e) Find the mean and variance of Poisson distribution. 5
- (f) Find the mean and mode of Normal distribution. 5

Please Turn Over

(3005)

Answer *any three* questions.

3. (a) Describe correlation index.
(b) How to fit an exponential curve to a bivariate data?
(c) Derive the formula of Spearman's rank correlation coefficient for no tie cases. 4+6+5
4. (a) Derive the linear regression equation of y on x using the method of least squares based on a bivariate data.
(b) Discuss the properties of regression coefficients. 9+6
5. (a) For two random variables X and Y , show that
 $E(X + Y) = E(X) + E(Y)$ and $V(X + Y) = V(X) + V(Y) + 2\text{Cov}(X, Y)$.
(b) Suppose a random variable X has the p.d.f.

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

Find c and also obtain $F(1)$, where $F(x)$ is cumulative distribution function of X . (4+5)+6

6. (a) Find the mean and variance of Binomial distribution.
(b) Show that Binomial distribution with parameters n and p can be approximated by Poisson distribution with parameter λ as $n \rightarrow \infty$, $p \rightarrow 0$ such that np remains fixed at λ . 9+6
7. (a) What do you mean by a standard normal distribution? Discuss its properties.
(b) The scores obtained by a group of students in a certain test are assumed to be normally distributed with mean 65 and standard deviation 5. What is the probability that a student will score above 70? 10+5