6. The first four raw moments of a distribution are 2, 136, 320 and 40000. Find the coefficients of skewness and kurtosis for this distribution. 4 **[CO3]**

★ ★ ★

Ex/SC/MATH/UG/MINOR/TH/11/101B/2025

Bachelor of Science Examination, 2025

(1st Year, 1st Semester)

MATHEMATICS

STATISTICS—I (MINOR)

Paper : MINOR/TH/11/101B

(Probability and Descriptive Statistics)

Time : 1 *Hour* 15 *Minutes* *Full Marks* : 24

Use separate Answer-Scripts for each Part.

Symbols / Notations have their usual meanings.

PART—I

(Marks : 08)

Answer *any* **two** questions : 4×2=8

1. *(a)* Prove that

$$\mathrm{Cov}(x, y) = \frac{1}{n}\sum_{1=1}^{n} x_i y_i - \overline{x}\,\overline{y}$$

Use the above result to prove that the correlation coefficient is symmetrical with respect to the variables.

(b) Prove that correlation coefficient of any two variables is independent of the units of measurement of the variables. (1+1)+2=4 **[CO1]**

2. Derive the equation of the regression line of y on x. Find the relation between the regression coefficient of x on y and the regression coefficient of y on x. 3+1=4 **[CO1]**

3. If two variables x and y are related by the relation $y = a + bx$, where a and b are constants. Show that the correlation coefficient between x and y is +1 or –1 according to whether $b > 0$ or $b < 0$. 4 **[CO1]**

PART—II

(Marks : 16)

Answer *any* **four** questions :

1. For any two events A and B it is given that $P(A) = 0.6$, $P(AB) = 0.3$ and $P(A \mid B) = 0.75$. Find $P(\bar{A}), P(\bar{B})$, $P(A\bar{B})$ and $P(\bar{A}B)$. 4 **[CO3]**

2. A pair of dice is thrown. Find the probability of getting *(i)* a sum of seven and *(ii)* a sum of seven, when it is known that the digit in the first die is greater than that of the second. Define conditional probability. 4 **[CO3]**

3. The probability density function of a random variable X is given as follows :

$$f(x) = \begin{cases} x & , \quad 0 \le x \le 1 \\ k - x & , \quad 1 \le x \le 2 \\ 0 & , \quad \text{elsewhere} \end{cases}$$

Determine the value of k and $P(1/2 < X < 3/2)$.

4 **[CO3]**

4. Suppose that 10 percent of the families in a certain city have no children, 45 percent have one child, 35 percent have two children and 10 percent have three children. Suppose further that in each family each child is equally likely (independently) to be a boy or a girl. If a family is chosen randomly from this city, find the joint probability mass function of the number of boys and number of girls in this family. Find also the marginal distributions of number of boys and number of girls.

4 **[CO3]**

5. Find mean and variance for the distribution,

$$f(x) = \begin{cases} \lambda e^{-\lambda x} & , \quad x > 0 \\ 0 & , \quad \text{elsewhere} \end{cases}$$

4 **[CO3]**