

[This question paper contains 4 printed pages.]

120

Your Roll No.

B.Sc. (G)/I

C

MATHEMATICAL SCIENCES (Statistics)

Paper I – Statistical Methods – I

Time : 3 Hours

Maximum Marks : 38

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

*Attempt Six questions in all, selecting at
least two questions from each Section.*

Question No. 1 is compulsory.

1. (a) The standard deviation of a symmetrical distribution is 5. What must be the value of the fourth moment about the mean in order that the distribution be leptokurtic? Also find measure of skewness.
- (b) Examine the consistency of the following data :
 $N = 100$, $(a) = 60$, $(b) = 50$, $(AB) = 5$.
- (c) For a Poisson variate X , $E(X^2) = 6$. Find mean and variance of X .
- (d) If $r(X, Y) = 0$, what is the value of $\text{cov}(X, Y)$.
How are X & Y related? (2.2.2.2)

P.T.O.

SECTION I

2. (a) Describe how you can represent a frequency distribution diagrammatically using cumulative frequencies. How will you obtain the value of Median, 1st quartile from this diagram?
- (b) The mean and standard deviation of a variable X are M and σ , respectively. If the deviations are small compared with the value of the mean, show that geometric mean G is given by
- $$G = M(1 - \sigma^2/2M^2), \text{ approximately.} \quad (3.3)$$
3. (a) Define skewness and kurtosis. How are they measured? Find the limits for Bowley's coefficient of skewness.
- (b) What do you understand by independence of attributes? Give a criterion of independence for attributes A and B. (3.3)
4. (a) Define line of regression. Find the angle between two lines of regression. Interpret the cases when $r = 0$, $r = +1$, and $r = -1$, where r is correlation coefficient.
- (b) Explain the method of fitting the curve $Y = ab^x$ by the method of least squares. How would you use the fitted curve for forecasting? (3.3)

5. (a) Show that the correlation coefficient is the geometric mean of the regression coefficients.
- (b) Give the concepts of multiple and partial correlation coefficients. Explain the notations $R_{1.23}$, $r_{12.3}$ and $X_{1.23}$. Write the limits of $R_{1.23}$ and $r_{12.3}$. (3,3)

SECTION II

6. (a) Show that for rectangular distribution :

$$f(x) = 1/(2a), \quad -a < x < a,$$

m.g.f, about origin is $(\sinh at)/(at)$.

- (b) Find the harmonic mean of a beta distribution of second kind. (3,3)

7. (a) If X_1 and X_2 are 2 independent random variables, each having exponential distribution with parameter λ ; obtain the distribution of $Y = X_1 + X_2$. Also identify the distribution.

- (b) Find mean deviation about mean for normal distribution. If $X \sim N(2,4)$, what is mean deviation about median? (3,3)

8. (a) State and prove 'Lack of Memory' property for geometric distribution.

- (b) Obtain binomial distribution as a limiting case of hyper-geometric distribution. (3,3)
9. (a) Let $(X, Y) \sim \text{BVN}(0, 0, 1, 1, \rho)$. Find the conditional distribution of Y given $X = x$.
- (b) Define negative binomial distribution. Obtain its moment generating function. Hence find its mean and variance. (3,3)