

[This question paper contains 4 printed pages.]

5020

Your Roll No.....

B.Sc. (G)/I

B

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 Mesokurtic distribution is 5. Find the value of μ_4 .
- (b) If $\sigma = 5$, $\bar{x} = 25$, find coefficient of variation C.V.
- (c) If correlation coefficient $r(X, Y) = 0.5$, find $r(U, V)$, where $U = -2X + 3$ and $V = 3Y - 4$.
- (d) If $M_X(t) = e^{3(e^t-1)}$; find the distribution of X . Hence, find mean and variance.
- (e) Examine the consistency of the following data :
 $N = 100$, $(A) = 60$, $(B) = 50$, $(AB) = 5$,
symbols have their usual meanings. (1,1,2,2,2)

P.T.O.

SECTION A

2. (a) Show that for any distribution, person's coefficient $\beta_2 > 1$.

- (b) Describe the different measures of central tendency of a frequency distribution. Also explain the graphic method of locating the median and mode. (3,3)

3. (a) Out of the two regression lines given by

$$X + 2Y - 5 = 0 \text{ and } 2X + 3Y - 8 = 0,$$

which one is the regression line of X on Y. Also, find correlation coefficient $r(X, Y)$.

- (b) Define Yule's coefficient of association Q and the coefficient of colligation Y. Establish the relation :

$$Q = \frac{2Y}{1 + Y^2} \quad (3,3)$$

4. (a) The coefficient of rank correlation of the marks obtained by 10 students in Maths and Statistics was found to be 0.5. It was later discovered that the difference in ranks in two subjects obtained by one of the students was wrongly taken as 3 instead of 7. Find the correct value of rank correlation coefficient.

- (b) Define coefficient of partial correlation $r_{12.3}$ and show that

$$r_{12.3} = \frac{r_{12} - r_{13} r_{23}}{\left[(1 - r_{13}^2)(1 - r_{23}^2) \right]^{1/2}} \quad (3,3)$$

SECTION B

5. (a) Find mode of X where $X \sim P(\lambda)$. (Poisson distn.)
Hence find mode when

(i) $X \sim P(3)$

(ii) $X \sim P(3.5)$

- (b) Define negative binomial distribution. Find its moment generating function. Hence find its mean & variance. (3,3)

6. (a) State and prove "Lack of Memory" property for geometric distribution.

- (b) Let X_1 and X_2 be independent normal variance with means μ_1, μ_2 and variances σ_1^2, σ_2^2 , respectively. Find the distribution of $Y = aX_1 + bX_2$. Hence, find coefficient of Skewness β , and coefficient of Kurtosis β_2 for r.v. Y . (3,3)

7. (a) What is the relationship between 'Exponential' distribution and 'Gamma' distribution. If X has an Exponential distribution with mean 2, find $P[X < 1 | X < 2]$.

- (b) If X has uniform distribution in $[0, 1]$, find the distribution (p.d.f.) of $-2\log X$ and identify the distribution. (3,3)
8. (a) Define Bivariate Normal Distribution. If $(X, Y) \sim \text{BVN}(2, 3, 4, 9, 0.2)$ then write
- (i) pdf of X (no derivation required)
 - (ii) pdf of $(Y/X = 4)$
 - (iii) pdf of $(2X - 3Y)$
- (b) State and prove additive property for Gamma distribution. (3,3)