RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR

B.A./B.SC. SECOND SEMESTER (January – June) 2013

Mid-Semester Examination, March 2013

Date : 05/03/2013 **STATISTICS (General)**

Time : 12 noon – 1 pm Paper : II Full Marks : 25

1. a) Define correlation coefficient between two variables. Show that it necessarily lies between –1 and +1. Also show that it remains invariant under a change of origin but is affected by a change of scale. [1+3+3]

Or

b) In case of a linear relationship between two variables, obtain the estimates of the regression coefficients and hence formulate a suitable prediction formula.

If $r_{xy} = 0$, does it follow that x, y are independent? Justify your answer. [5+2]

2. a) Define correlation-ratio. Show that $0 \le r_{xy}^2 \le e_{yx}^2 \le 1$. [5]

Or

b) Define a scatter-diagram and discuss how it is helpful in understanding the relationship between two variables.

Suppose one is interested to study a qualitative variable on the basis of a few dependent variables which are quantitative. Suggest a suitable measure of correlation and give reasons for your choice. [2+1+2]

3. Answer **any two** : [2×5]

a) Let $F : \mathbb{R} \to \mathbb{R}$ be defined by

$$F(x) = \begin{cases} 0, x < 0 \\ x, 0 \le x \le ½ \\ 1, x \ge ½ \end{cases}$$

Show that F is a distribution function. Hence find $P\left(\frac{1}{3} < x \le \frac{3}{8}\right)$ [3+2]

b) Let X be a continuous random variable with pdf $f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}$, $-\infty < x < +\infty$.

Find the pdf of $Y = X^2$. [5]

c) Let X be a discrete random variable with pmf

$$P(X = x) = \begin{cases} \theta(1-\theta)^{x-1}, x \in \mathbb{N} \\ 0, \text{ elsewhere} \end{cases}$$

Find the median of X. [5]

d) Let (X,Y) be jointly distributed with density function

$$f(x, y) = \begin{cases} x + y, 0 < x, y < 1 \\ 0, \text{ elsewhere} \end{cases}$$

Find the correlation-coefficient between X and Y. [5]

4. In case of Spearman's rank correlation coefficient without tie what happens if there is—
   a) complete agreement
   b) complete disagreement
   with respect to the ranks? [1+2]

Or

Show that Spearman's rank correlation coefficient (in case of no ties) is actually the product moment correlation coefficient of the ranks. [3]

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