RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2017

FIRST YEAR [BATCH 2016-19]

Date : 24/05/2017 **STATISTICS (General)**

Time : 11 am – 1 pm **Paper : II** Full Marks : 50

[Use a separate Answer Book for <u>each group</u>]

Group – A

1. Answer **any three** questions: [3X5]
   a) Define correlation ratio. Show that the numerical value of correlation ratio is greater than the numerical value of correlation coefficient.
   b) Define correlation index. Interprete the situation $o \le r^2 < r_3^2 = e_{yx}^2 = 1$
   where r, r_3 and e_{yx} are respectively correlation coefficient, correlation index of order 3 and correlation ratio.
   c) Show that $\left(1-r_{1.23}^2\right)=\left(1-r_{12}^2\right)\left(1-r_{13.2}^2\right)$ where $r_{13.2}$ is partial correlation coefficient between x_1 and x_3 given x_2. Hence or otherwise prove that the value of multiple correlation coefficient cannot be less than the value of any total correlation coefficient or the value of any partial correlation coefficient.
   d) Explain your understanding about association between two attributes. Hence establish any one measure of association of attributes.

2. Establish the multiple regression equation of x_1 on x_2 and x_3. Hence define partial regression coefficients. 10

OR

Write short notes on **any two** of the following topics: 5+5
   a) Partial correlation
   b) Intraclass correlation
   c) Goodman-Kruskal measure of association.

Group – B

Answer **any two** questions from **Question Nos. 3 to 6**: [2X5]

3. Zero covariance between two random variables does not necessarily mean they are independent. Justify the statement with an example.

4. A random variable X follows binomial distribution with parameters n and p. Show that $P(X = even) = \frac{1}{2}\left[1+(1-2p)^n\right]$.

5. Determine $f(x)$, the probability mass function from $f(x) = \frac{\lambda}{x} f(x-1),\ x = 1, 2, \cdots$
   where $f(x)$ is non-zero for non-negative integral values of the random variable X.

6. Show that for the exponential distribution defined by the pdf $\left.\begin{aligned} f(x) &= \theta e^{-\theta x},\ x \ge 0 \\ &= 0 \quad ,\text{elsewhere} \end{aligned}\right\}\ \theta > 0$
   $P(X > S + t / X > t) = P(X > S)$.

Answer **any one** question from **Question Nos. 5 & 6**: [1X15]

5. a) Let X denote the number obtained from the throw of a die. Let Y be another variable such that

$$\begin{aligned} Y &= +1 \quad \text{when } X \text{ is odd} \\ &= -1 \quad \text{when } X \text{ is even} \end{aligned}$$

From the joint distribution of X & Y, find variance of $Z = XY$. Are X & Y independent? 5+3

b) X & Y jointly follow bivariate Normal distribution with parameters 0, 0, 1, 1, ρ. Show that when ρ = 0, X & Y are independent. 4

c) State weak law of large numbers (WLLN) & De-Moivere Laplace limit theorem. 3

6. a) Suppose $\log X \sim N(\mu, \sigma^2)$. Find the distribution of X. 3

b) If a Normal distribution is symmetrical about 5 with standard deviation 2, what are the points of inflection of the distribution? 2

c) If X & Y are two independent Normal variables with mean 5 & 7 and s.ds 3 & 4 respectively, find the mean & s.d of $(3X - 2Y)$. 2

d) An unbiased coin is tossed 200 times. Find the probability that the number of heads appearing is between 110 and 120 (inclusive both values). 8

Given $\begin{cases} \Phi(1.34) = 0.9098773 \text{ and} \\ \Phi(2.89) = 0.998073 \end{cases}$.

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