

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2016

FIRST YEAR [BATCH 2015-18]

STATISTICS (General)

Date : 25/05/2016

Time : 11 am – 1 pm

Paper : II

Full Marks : 50

[Use a separate Answer Book for each group]

Group - A

1. Answer **any two** questions : [2×5]

a) What do you mean by independence of two attributes? Give a criterion of independence for attributes A and B.

Define Yule's coefficient of association and the coefficient of colligation.

b) Define Correlation coefficient r_{xy} and the correlation ratio η_{yx} . When is the latter a more suitable measure of association than the former?

c) Define Multiple Correlation $R_{1.23}$. If all the correlation coefficients of zero order in a set of variates are equal to ρ , show that $1 - R_{1.23}^2 = \frac{(1-\rho)(1+2\rho)}{(1+\rho)}$.

d) Define Partial Correlation coefficient. Show that if $X_3 = aX_1 + bX_2$, the three partial correlation coefficients are numerically equal to unity (assuming X_1 and X_2 to be independent).

Answer **any one** question from question nos. 2 & 3 : [1×15]

2. a) Derive the tri-variate linear regression equation of X_1 on X_2 and X_3 . [10]

b) Show that the multiple correlation coefficient $R_{1.23}$ can be expressed as $R_{1.23}^2 = 1 - \frac{R}{R_{11}}$ in usual notation. [5]

3. a) Show that the correlation ratio η_{yx} satisfies the relation $0 \leq \eta_{yx}^2 \leq 1$. [5]

b) Prove that the residual variance $\sigma_{1.23}^2$ can be expressed as $\sigma_{1.23}^2 = \sigma_1^2 (1 - r_{12}^2)(1 - r_{13.2}^2)$, symbols have their usual meanings. [10]

Group - B

4. Answer **any two** questions : [2×5]

a) Let $X \sim \text{binomial}(2, p)$ & $Y \sim b(4, p)$. If $P(X \geq 1) = \frac{5}{9}$, find $P(Y \geq 1)$.

b) If $X \sim \text{Normal}(0, 1)$, find the distribution of e^X and its mean.

c) i) Suppose that in a sequence of independent bernoullian trials each with probability of success p , the number of failures up to the first success is counted. What is the p.m.f of this random variable?

ii) In a sequence of independent bernoullian trials with probability p of success, what is the probability that there are r successes before the K^{th} failure? [2+3]

d) If the joint p.d.f. of the random variables X and Y is

$$f(x, y) = \begin{cases} K(3x + y) & ; \quad 1 \leq x \leq 3, 0 \leq y \leq 2 \\ 0 & ; \quad \text{elsewhere} \end{cases}$$

find the value of K .

Answer **any one** question from question nos. 5 & 6 :

[1×15]

5. a) The p.d.f of a certain random variable is given by $f(x) = \sqrt{\frac{2}{\pi}} e^{-2(x-3)^2}$; $-\infty < x < \infty$. Identify the distribution of X. [5]
- b) If a die is thrown 1800 times, find the probability that frequency of the event 'multiple of three' lies between 600 ∓ 50 .
[Given the area under standard normal curve between 0 and 2.5 is 0.494. No need for continuity correction] [5]
- c) Derive the mean deviation about mean of Standard normal variable. [5]
6. a) A person selects a number randomly from the set {1,2,3,4,5}. Next he draws another number from the set of integers remaining after discarding all integers less than the first selected integer. Let X & Y denote the numbers drawn in the 1st & 2nd draw respectively. Construct a bivariate table showing the joint probability distribution of X & Y. Also find $P(X+Y > 7)$. [7]
- b) Assuming the joint distribution of two discrete random variables X & Y, show $E(Y) = E[E(Y|X)]$. [5]
- c) State the weak law of large numbers. [3]

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