RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. SECOND SEMESTER EXAMINATION, MAY 2025

FIRST YEAR (BATCH 2024-28)

STATISTICS

Date : 24/05/2025

Time : 11 am – 1 pm

Paper : 2STACOC1

Full Marks : 50

[Use a separate Answer Book for each Group]

Group-A

Answer **any five** questions : [5×5]

1. Suppose three variables x_1, x_2, x_3 satisfy the relation $2x_1+3x_2+4x_3=5$, what will be the value of partial correlation coefficients.
2. Obtain the multiple regression equation of x_3 on x_1 and x_2 is
$$x_3-\bar{x}_3=\left(\frac{r_{13}-r_{23}r_{12}}{1-r_{12}^2}\right)\left(\frac{s_3}{s_1}\right)\left(x_1-\bar{x}_1\right)+\left(\frac{r_{23}-r_{12}r_{13}}{1-r_{12}^2}\right)\left(\frac{s_3}{s_2}\right)\left(x_2-\bar{x}_2\right).$$
3. Show that $r_{12}^2+r_{13}^2+r_{23}^2-2r_{12}r_{13}r_{23}\le 1$, where symbols have usual meaning.
4. What do you mean by coefficient of multiple determination and adjusted R^2.
5. Show that the three variables multiple correlation coefficient can be expressed in terms of total and partial correlation coefficients as $1-R_{2.13}^2=\left(1-r_{21}^2\right)\left(1-r_{23.1}^2\right)$.
6. Prove that the standard error of estimate of x_1 on x_2 and x_3 is $s_{1.23}=s_1\sqrt{\dfrac{1-r_{12}^2-r_{13}^2-r_{23}^2+2r_{12}r_{13}r_{23}}{1-r_{23}^2}}$ where r_{12}, r_{13}, r_{23} are correlation coefficients.

Group-B

Answer **any five** questions : [5×5]

7. Determine $f(x)$, the probability mass function from $f(x)=\dfrac{\lambda}{x}f(x-1)$, $x=1, 2, \ldots$ where $f(x)$ is non zero for non-negative integral values of the random variable *X*.
8. See if the following function can be accepted as a probability density function :
$$f(x)=\frac{5}{\sqrt{\pi}}e^{-25x^2} \qquad ; -\infty<x<\infty$$
If so, write down two important properties of this distribution. (3+2)
9. Derive exponential distribution from Poisson distribution.
10. a) State the central limit theorem.
    b) Write down the p.d.f of the bivariate normal $(0, 0, 1, 1, \rho)$ distribution.
    c) Verify if $\rho=0$ in bivariate normal distribution implies independence. (2+2+1)
11. Calculate the mean of geometric distribution.
12. Prove the memoryless property of exponential distribution.

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