Roll No.							

25-ST-22

M.Sc. II SEMESTER [MAIN/ATKT] EXAMINATION
MAY - JUNE 2025

STATISTICS

Paper - II

[Distribution Theory - II]

[Max. Marks : 75] *[Time : 3:00 Hrs.]* *[Min. Marks : 26]*

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt all five questions. Each question carries an internal choice.
Each question carries **15 marks.**

Q. 1 a) Explain independence of Random Variables.

b) Two independent random variable (X, Y) have the joint density

$$f(x, y) = \begin{cases} 8xy, & 0 < x < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

then, (i) Find the marginal and conditional distributions.

(ii) Are X and Y independent ? Give reasons for your answer.

OR

a) Explain joint distribution function. What are its properties.

b) The joint p.d.f. of random variable X and Y is given by -

$$f(x, y) = \frac{9(1 + x + y)}{2(1 + x)^4 (1 + y)^4} \quad ; \quad \begin{matrix} 0 < x, \infty \\ 0 < y, \infty \end{matrix}$$

find marginal distribution of X and Y and the conditional distribution of Y for X = x.

Q. 2 Define correlation coefficient. Show that the correlation coefficient is independent of change of origin and scale.

OR

Prove that (X, Y) possesses a bivariate normal distribution if and only if every linear combination of X and Y viz. $aX + bY$, $a \neq 0$, $b \neq 0$ is a normal variate.

Q. 3 Explain Chi-square distribution and its properties ?

P.T.O.

OR

Define student 't'. Write the probability density function of 't' distribution. Explain the applications of t- distribution.

Q. 4 What is non central χ^2 distribution ? How does it differ from central χ^2 distribution ? Obtain probability density function of non - central χ^2 distribution.

OR

Define non central 't' distribution and derive its probability density function?

Q. 5 Derive the distribution of sample correlation coefficient r when $\rho = 0$.

OR

Obtain Sampling Distribution of Sample variance in bivariate normal situation.

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