

Roll.No.

22PAMET1001

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

M.Sc.Applicable Mathematics - END SEMESTER EXAMINATIONS - NOVEMBER 2025
SEMESTER - I

22PAMET1001 - Probability and Distributions

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

1. Find the mean of Poisson distribution.
2. Describe the properties of covariance of two dimensional random variables.
3. Write the probability density function of F distribution stating the assumptions.
4. If X_1, X_2, \dots, X_n be a random sample from a normal population with mean μ and variance σ^2 and if the sample mean \bar{X} and variance S^2 are independent then show that $\frac{\sqrt{n}(\bar{X} - \mu)}{c} \sim t_{(n-1)}$
5. Define the classical and axiomatic approach to probability.
6. If X and Y follow bivariate normal distribution. Compute the joint and marginal density functions of X and Y.
7. Describe Lindberg Levy Central Limit theorem.
8. Let (X,Y) be jointly distributed with p.d.f $f(x, y) = 2, 0 < x < 1, 0 < y < x$ and 0 otherwise. Compute the marginal and conditional density functions of x and y. Determine whether they are independent.

Section C

I - Answer any **TWO** questions ($2 \times 10 = 20$ Marks)

9. Illustrate with an example that the convergence in Probability implies convergence in distribution but the converse is not true.
10. Compute the moment generating function of Normal distribution and hence find its mean and variance.
11. Examine the marginal mean and variance of bivariate binomial distribution.
12. Derive the moment generating function of Chi-square distribution and hence evaluate its additive property.

Contd...

II - Compulsory question (1 × 10 = 10 Marks)

13. Two random variables X and Y have the following joint probability density function

$$f(x,y) = \begin{cases} 2 - x - y; & 0 \leq x \leq 1 \\ 0; & \textit{otherwise} \end{cases}$$

Compute:

- (i) Marginal probability density functions of X and Y
- (ii) Conditional density functions X/Y and Y/X
- (iii) Expectations of X and Y
- (iv) Covariance between X and Y
