

Roll.No.

20PBSCT1001

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.Biostatistics - END SEMESTER EXAMINATIONS - NOVEMBER 2025  
SEMESTER - I

**20PBSCT1001 - Probability and Distribution Theory**

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

**Section B**

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

1. Explain Bayes' theorem and its application in screening tests.
2. Derive and interpret the covariance and correlation of two random variables.
3. State and Prove the Classical Central Limit Theorem and discuss its significance.
4. Discuss the properties of the Negative Binomial distribution.
5. Explain the concept of truncated distributions with examples.
6. Derive the mean and variance of the Bivariate Poisson distribution.
7. Explain the applications of the Multivariate Normal Distribution.
8. Discuss the concept of linear transformation of a random variable.

**Section C**

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

9. Derive Bayes' theorem and apply it to a real-world problem. Suppose a rare disease affects 1 in 1,000 people. A diagnostic test for the disease has a sensitivity of 95 % and a specificity of 98%. If a randomly selected individual tests positive, what is the probability that they actually have the disease?
10. Explain the concept of convolution, conditional expectations.
11. Derive the distribution of sample mean vector.
12. Explain order statistics and their role in probability distributions.

II - Compulsory question ( $1 \times 10 = 10$  Marks)

13. Discuss the marginal and conditional distributions for a Bivariate Normal Distribution.

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