

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.

B.Sc.Statistics - END SEMESTER EXAMINATIONS - NOVEMBER 2025

SEMESTER - I

20USTCT1002 - Probability and Random Variables

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

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

1. i) Prove that $P(A) \leq P(B)$ if $A \subseteq B$.
ii) Prove that $P(S) = 1$.
2. State and prove multiplication theorem on probability for two events and write the statement only for 3 events.
3. State and Prove Addition theorem on Mathematical expectation.
4. Explain Marginal and Conditional Distribution.
5. Define Characteristic Function and Explain its Properties.
6. Under Mathematical Exception, Prove that
(i) $E(ax) = a.E(x)$
(ii) $E(ax + b) = aE(x) + b$
Where a and b are constants.
7. Define the following term.
(i) Probability Density function.
(ii) Probability Mass Function.
(iii) Stochastic Independence.
8. If two dice are thrown, what is the probability that the sum is
(i) greater than 9 and
(ii) neither 8 nor 10.

Section C

Answer any **THREE** questions ($3 \times 10 = 30$ Marks)

9. State and Prove Boole's inequality.
10. State and prove Baye's Theorem.
11. The m.g.f of the random variable X is $(1 - 2t)^{-2}$. Find the mean and variance of X.
12. State and Prove Chebychev's Inequality.
13. Explain convergence in probability, convergence in distribution and weak law of large numbers.