

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 - APRIL 2025  
SEMESTER - II

**20USTCT2003 - Distribution Theory - I**

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

**Section B**

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

1. The mean and variance of Binomial distribution are 4 and  $4/3$  respectively.  
Find  $P(X \geq 1)$ .

2. State and Prove additive property of Poisson Random Variate.

3. Explain the process of deriving m.g.f of Negative Binomial Distribution.

4. The trinomial Distribution of two R.V's X and Y is given by

$$f_{X,Y}(x, y) = \frac{n!}{x!y!(n-x-y)!} p^x q^y (1-p-q)^{n-x-y}$$

For  $x, y = 0, 1, 2, \dots, n$  and  $x+y \leq n$ , where  $0 \leq p$ ,  $0 \leq q$  and  $p+q \leq 1$ .

Compute the marginal distribution of X and Y.

5. Compute the Median of the Normal Distribution.

6. Deduce the m.g.f of Normal Distribution from it's pdf.

7. Compute the m.g.f of Geometric Distribution.

8. Show that the variance of Hyper Geometric Distribution is  $\frac{NM(N-M)(N-n)}{N^2(N-1)}$ .

**Section C**

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

9. Derive the mean and Variance of the Binomial Distribution.

10. Prove that Poisson Distribution is a limiting case of Binomial Distribution.

11. Suppose X is a non- negative valued random variable. Show that the distribution of X is geometric if it lacks memory i.e., if for each  $k \geq 0$  and  $Y = X - k$ , one has  $P(Y = t / X \geq k) = P(X = t)$ , for  $t \geq 0$ .

12. If  $X_1, X_2, \dots, X_k$  are k independent Poisson variates with parameter  $\lambda_1, \lambda_2, \dots, \lambda_k$  respectively, Prove that the conditional distribution;  $P(X_1 \cap X_2 \cap \dots \cap X_k / X)$ , Where  $X = X_1 + X_2 + \dots + X_k$  is fixed, is multinomial.

13. Derive the Moments of Normal Distribution.

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