K23N 0422

Reg. No. : ....

Name : ....

I Semester M.Sc. Degree (CBSS – Reg./Supple./Imp.) Examination, October 2023
(2022 Admission Onwards)
STATISTICS WITH DATA ANALYTICS
MST1C03 : Distribution Theory

Time : 3 Hours Max. Marks : 80

PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. Define MGF and obtain the MGF of Binomial distribution.
2. State lack of memory property. Give any two distributions having this property.
3. Define Normal distribution. State any two properties of Normal distribution.
4. If X is a random variable with continuous distribution function F, then prove that F(X) has a uniform distribution on [0,1].
5. Define Multinomial distribution and give the expression for the m.g.f of it.
6. Let X be a random variable with Standard Normal PDF. Find the truncated pdf of X truncated at 0.
7. Define Non-central Chi-square Distribution. State the additive property of Non-central Chi-square distribution.
8. Define conditional and marginal distributions. **(8×2=16)**

PART – B

Answer **any four** questions. **Each** question carries **4** marks.

9. Derive the recurrence relation for the moments of the Poisson distribution.
10. Define generalized power series distribution. Find the m.g.f of power series distribution.

P.T.O.

11. Let $X_1, X_2, \ldots X_n$ are independent random variables, X_i having an Exponential distribution with parameter θ_i , i = 1, 2, ... , n. Find the distribution of $X_{(1)}$.

12. Find the marginal distribution of Bivariate Normal distribution.

13. Derive the probability density function of the largest order statistic $X_{(n)}$.

14. Show that for large degrees of freedom, t distribution tends to standard normal distribution. **(4×4=16)**

PART – C

Answer **any four** questions. **Each** question carries **12** marks.

15. i) Define Negative Binomial distribution.

    ii) Obtain the moment generating function of Negative Binomial distribution and hence find its mean and variance.

16. i) Define Gamma distribution.

    ii) If X and Y are independent Gamma variates with parameters μ and v then Show that $X + Y$ and $\frac{X}{X+Y}$ are independent and also find their distributions.

17. Define non central t distribution. Derive the probability density function of it.

18. Find the distribution of median of a sample of odd size from U [0,1]. Also find its mean and variance.

19. Let $X_1, X_2, \ldots X_n$ be a random sample of size n from $N(\mu, \sigma^2)$. Show that the sample mean $\bar{X}$ and sample mean s^2 are independently distributed. Deduce their distributions.

20. If $X_1, X_2, \ldots X_k$ are k independent Poisson variates with parameters $\lambda_1, \lambda_2, \ldots, \lambda_k$ respectively then prove that the conditional distribution

    $P[\{(X_1 = r_1) \cap (X_2 = r_2) \cap \ldots (X_k = r_k)\}/\{X = n\}]$ where $X = X_1 + X_2 + \ldots + X_k$ is fixed, is a multinomial distribution. **(4×12=48)**
