24U308S (Pages: 2) Name: .....

Reg.No: .....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2025

(CBCSS - UG)

CC19USTA3C03 - PROBABILITY DISTRIBUTIONS AND SAMPLING THEORY

(Statistics - Complementary Course)

(2019 to 2023 Admissions - Supplementary/Improvement)

Time : 2.00 Hours Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

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

1. Under what conditions Binomial distribution tends to Poisson distribution.
2. Define geometric distribution.
3. Obtain the mean of Uniform distribution(discrete type).
4. Describe Lognormal distribution.
5. Define Pareto distribution.
6. What do you mean by convergence in probability.
7. State Bernoulli's law of large numbers.
8. Mension any two disadvantages of simple random sampling compared to stratified random sampling.
9. Define sampling distribution.
10. A random sample of size 100 are drawn from a normal population with mean 20 and variance 225. Find the mean and variance of sample mean .
11. State the reproductive property of chi-square distribution for 'k' independent variates.
12. If $Y \sim \chi^2_5$, find the mode of Y.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Derive the recurrence relation for central moments of Poisson distribution.
14. If $X_1, X_2, \ldots . X_n$ are independent random variables having exponential distribution with parameter λ, find the distribution of $Y = \sum_{i=1}^{n} X_i$.

15. If X_1 and X_2 are independent normal random variables with respective means -1 and 2 and respective variances 3 and 7 ,find a and b such that $aX_1 + bX_2$ is a standard normal.

16. Let $\bar{X}$ be the mean based on 16 independent observations from a Poisson distribution with mean 4. Apply CLT to find approximation to $P(3 < \bar{X} < 5)$.

17. What are the differences between sampling errors and non-sampling errors?

18. If X_1 and X_2 are two independent standard normal variates, find the distribution of $\frac{X_1^2}{X_1^2+X_2^2}$.

19. State the relationship between normal, Chi-square, t anf F distributions.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

20. (a) State Chebysheve's inequality.
    (b) A random variable X has mean 50 and variance 100.Use Chebyshev's inequality to obtain appropriate bounds for (i) $P[|X - 50| \geq 15]$ (ii) $P[|X - 50| \leq 20]$.

21. If $X_1, X_2, ..., X_n$ are 'n' random samples taken from $N(\mu, \sigma)$, find the distribution of sample variance 's^2'.

(1 × 10 = 10 Marks)

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