D 111994 **(Pages : 2)** **Name.....**

Reg. No.....

THIRD SEMESTER (CBCSS-UG) DEGREE EXAMINATION, NOVEMBER 2024

Statistics

STA 3C 03—PROBABILITY DISTRIBUTIONS AND SAMPLING THEORY

(2019—2023 Admissions)

Time : Two Hours Maximum : 60 Marks

Use of calculator and Statistical table are permitted.

Section A (Short Answer Type Questions)

All *questions can be attended.*
Each questions carries 2 *marks.*
Overall ceiling 20.

1. State the conditions that must be fulfilled for using a binomial distribution.
2. Obtain the m.g.f. of a Poisson distribution with parameter m.
3. Define Negative Binomial distribution.
4. Define Rectangular distribution
5. State Tchebycheff's inequality.
6. State Weak law of large numbers.
7. What do you meant by convergence in probability ?
8. What are the merits of sample survey ?
9. Explain the lottery method of selecting a simple random sample.
10. Define Chi square distribution and state its applications.
11. What is the square of a random variable following t distribution with n degrees of freedom
12. If X has a F distribution with n_1 and n_2 degrees of freedom, what is the distribution of 1/X ?

(Ceiling : 20 marks)

Section B (Short Essay/Paragraph Type Questions)

All *questions can be attended.*
Each questions carries 5 *marks.*
Overall ceiling 30.

13. State and prove recurrence relation for central moments for a Binomial distribution.
14. Find the mean and S.D. of normal population $N(\mu, \sigma^2)$, if 10% of the items are under 40 and 95% of the items are under 75.

Turn over

15. State and prove Bernoulli's law of large numbers.
16. Using Central Limit Theorem prove that one parameter Gamma distributin tends to normal distribution.
17. Explain stratified random sampling.
18. Give the procedure of selecting a linear systematic sample of size 5 from a population of size 30.
19. Prove that square of a t random variable is F random variable.

(Ceiling : 30 marks)

Section C (Essay Type Questions)

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

20. (a) If X follow $N(\mu, \sigma^2)$, find k if $P(X \leq k) = 4P(X \geq K)$

    (b) In a single throw a two dice, find the chance of throwing (1) eight and (2) eleven.

21. (a) The following data on the measurements of the fat content of two kinds of ice creams brand A and brand B yielded the following results :

Brand A	...	13.5	14.0	13.6	12.9	13.0
Brand B	...	12..9	13.0	12.4	13.5	12.7

Find $P\left[\sigma_1^2 > 5.75\sigma_2^2\right]$ where σ_1^2 and σ_2^2 are the population variances.

(1 × 10 = 10 marks)