D 131499 **(Pages : 2)** **Name.....**

Reg. No.....

THIRD SEMESTER (CBCSS—U.G.) DEGREE EXAMINATION
NOVEMBER 2025

Statistics

STA 3C 03—PROBABILITY DISTRIBUTIONS AND SAMPLING THEORY

(2020-2023 Admissions)

Time : Two Hours Maximum : 60 Marks

Use of calculator and Statistical table are permitted.

Section A (Short Answer Type Questions)

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

1. Establish the relationship between Binomial distribution and Poisson distribution.
2. Obtain the m.g.f of a discrete uniform distribution.
3. Obtain mean and variance of Geometric distribution.
4. Define Cauchy distribution.
5. Distinguish between distribution parameter and population parameter.
6. State Bernoulli's law of large numbers.
7. A random variable X has a mean value of 5 and variance of 3, What is the least value of $Prob\left[|X-5|<3\right]$?
8. What do you meant by proportional allocation ?
9. What is probability sampling ? Give an example.
10. If $t \sim t_n$, find the mode of t.

Turn over

11. What is meant by degrees of freedom ?

12. Define chi-square distribution.

(Ceiling 20 marks)

Section B (Short Essay/ Paragraph Type Questions)

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

13. State lack of memory property. Show that Geometric distribution possess the lack of memory property.

14. The mean annual sales of a firm is worth Rs. 150 with a S.D of Rs. 20. For how many days in a year of 365 days, his sales are expected to be worth less than Rs. 100 ?

15. State and prove Lindberg levy form of central limit theorem.

16. If X has the distribution with p.d.f. $f(x) = e^{-x}, x > 0,$ use Chebychev's inequality to obtain a lower bound to the probability to the inequality $(-1 \le X \le 3),$ and compare it with actual value.

17. Examine whether the law of large numbers holds for the sequence $\{X_k\}$ of independent random variables defined by $P\left(X_k = \pm k^{1/2}\right) = 1/2.$

18. Explain systematic random sampling.

19. Derive the variance of χ^2 distribution with n d.f.

(Ceiling 30 marks)

Section C (Essay Type Questions)

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

20. If the average monthly income of 100 employees normally distributed is Rs. 900 with a standard deviation of Rs. 60, what should be the lowest monthly income of the 10 highest paid employees ?

21. Define F distribution. Define F distribution. Find the maximum difference that we can expect with probability 0.95 between the means of samples of sizes 10 and 12 from a normal population if their standard deviations are found to be 2 and 3 respectively.

(1 × 10 = 10 marks)