

D 51782

(Pages : 2)

Name.....

Reg. No.....

**THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2023**

Statistics

STA 3C 03—PROBABILITY DISTRIBUTIONS AND SAMPLING THEORY

(2019—2022 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 question carries 2 marks.**Overall Ceiling 20.*

1. Establish the relationship between Geometric distribution and discrete uniform distribution.
2. Obtain the m.g.f of a $N(\mu, \sigma^2)$.
3. Obtain mean and variance of Poisson distribution.
4. Define Pareto distribution.
5. Distinguish between parameter and statistic.
6. What are the advantageous and disadvantageous of Chebycheff's inequality.
7. Use any law of large numbers to prove that in 2000 throws with a coin the probability that the number of heads lies between 900 and 1100 is atleast $19/20$.
8. What is the principal of optimum allocation ?
9. What is non probability sampling ? Give an example.
10. Define Student's t distribution.
11. Give a relationship between t and F distribution.
12. A random sample of 14 independent observations is taken from $N(\mu, \sigma^2)$, what is the mean and variance of Chi-square derived from it ?

(Ceiling 20 marks)

Turn over

Section B (Short Essay/ Paragraph Type Questions)*All questions can be attended.**Each question carries 5 marks.**Overall Ceiling 30.*

13. Establish the relationship between Binomial distribution and Poisson distribution.
14. Find the mgf of Normal population $N(\mu, \sigma^2)$.
15. State and prove the weak law of large numbers. Deduce as a corollary Bernoulli theorem and comment on its applications.
16. If X denote the sum of the numbers obtained when two dice are thrown, use Chebychev's inequality to obtain an upper bound for $P[|X - 7| > 4]$. Compare this with the actual probability.
17. Use central limit theorem to establish a relationship between Binomial distribution and Normal distribution.
18. Carry out a comparison between census method and sampling method. Explain systematic random sampling.
19. A sample of size 16 is taken from a normal population with mean 1 and S.D 1.5. Find the probability that the sample mean is negative.

(Ceiling 30 marks)

Section C (Essay Type Questions)*Answer any one question.**The question carries 10 marks.*

20. a) If 3 % of electric bulbs are found to be defective, then using Poisson's approximation, find the probability that a sample of 100 bulbs will contain (i) no defective ; and (2) exactly one defective.
b) A random variable X is normally distributed with mean 12 and S.D 2, Find the probability of the event $9.6 \leq x \leq 13.8$.
21. a) How large a sample is to be taken from a normal population $N(10, 3)$ if the sample mean is to lie between 8 and 12 with probability 0.95.
b) Two independent samples of sizes 15 and 20 from a normal population $N(\mu, \sigma^2)$, Find the upper bound to $P\left(\frac{S_1^2}{S_2^2} < 2\right)$.

(1 × 10 = 10 marks)