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D3BST2101 (PAGES 2) Reg.No............................

Name: ....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

(Regular/Improvement/Supplementary)

STATISTICS: COMPLEMENTARY COURSE FOR MATHEMATICS & COMPUTER SCIENCE

GSTA3C03T: PROBABLITY DISTRUBUTION AND SAMPLING THEORY

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks. (Ceiling 20 Marks)

1. Derive the mean of Binomial distribution with parameters n and p.
2. State additive property of Gamma distribution.
3. Define convergence in probability.
4. If $X \rightarrow N(16, 2)$, find an upper bound for $P(|X - 16| > 6)$ using Chebychev's inequality.
5. Define population.
6. What is probability sampling?
7. Explain Lottery method in random sampling.
8. Define standard error. Give any three uses of standard error.
9. Write down the pdf of sample mean of a random sample of size n from a normal population with parameters μ and σ^2.
10. State the additive property of Chi - square distribution.
11. Write down the probability density function of Student t distribution. Indicate its important applications.
12. Give one example of a statistic following F distribution.

SECTION B: Answer the following questions. Each carries *five* marks. (Ceiling 30 Marks)

13. If X and Y are independent binomial random variables with parameter n_1 and n_2, find the distribution of X / X +Y.
14. For a continuous Uniform distribution, $f(x) = \frac{1}{2a}; -a < X < a$, show that $\mu_{2r} = \frac{a^{2r}}{2r+1}$.
15. 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) $P\{|x - 50| < 20\}$

(PTO)

16. Explain Bernoulli's law of large numbers with an example.

17. Describe cluster random sampling.

18. If X follows chi-square with n degrees of freedom, obtain the distribution of $\frac{X}{2}$.

19. Show that the mean deviation about mean of a t distribution with n degrees of freedom is

$$\frac{\sqrt{n}\,\Gamma\left(\frac{n-1}{2}\right)}{\sqrt{\pi}\,\Gamma\left(\frac{n}{2}\right)}$$

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. (i) Define Normal distribution. What are the important properties of Normal distribution?

(ii) If X is normally distributed with mean 11 and SD 1.5, find the number k such that

(a) $P(X > k) = 0.3$ and (b) $P(X < k) = 0.09$

21. State and prove the Lindberg-Levy central limit theorem.

(1 x 10 = 10 Marks)