Reg. No ..... Name **23U443**

B. Sc. DEGREE END SEMESTER EXAMINATION : MARCH 2023

SEMESTER 4 : MATHEMATICS / COMPUTER APPLICATIONS

COURSE : **19U4CPSTA04 / 19U4CRSTA04 : STATISTICAL INFERENCE**

(For Regular - 2021 Admission and Improvement / Supplementary - 2020 / 2019 Admissions)

Time : Three Hours Max. Marks: 75

(Use of Scientific calculator and statistical tables are permitted)

PART A

(Each Question carries 1 mark. Maximum marks from this part is 10)

1. Write the null hypohesis in analysis of variance with one-way classification.
2. Significance level of a test lies between ---------- and ----------
3. For the distribution f(x) = $\frac{1}{\theta}\, e^{-\frac{x}{\theta}}$; $0 < x < \infty,\ 0 < \theta < \infty$ an unbiased estimator of θ is ------
4. Define unbiasedness?
5. The diameter of cylindrical rod is assumed to be normal with a variance of 0.04 cm. A sample of 50 rods has a mean diameter of 4.5 cm. Find the 95% confidence limits for population mean
6. The p - value of a paired t test is 0.005. What decision will be taken at 1% level of significance?
7. Write the formula for finding the confidence interval for mean when sample size is large.
8. In 10,000 tosses of a coin, tail turns up 4950 times. Is it reasonable to think that the coin is unbiased?
9. Wrtie down the test statistic for testing $H_0 : \sigma = \sigma_0$
10. Define efficiency?
11. Write the 95% confidence interval for the population proportion based on a large sample proportion p
12. A sample of 12 specimen taken from a normal population is expected to have a mean =50. The sample has mean 64 with a variance 25. Write the test statistic for testing, H0:μ=μ0 H1:μ≠μ0.

PART B

(Each question carries 3 marks. Maximum marks from this part is 15)

13. A sample of 100 gave a mean of 74 kg and s.d. of 1.2 kg. Find a 95% confidence interval for the population mean?
14. What do you understand by the terms testing of hypothesis and level of significance?
15. Define consistent estimator. Show that means of samples taken form a normal population are consistent estimates of the population mean.
16. Explain the applications of Z-test.
17. Derive the confidene interval for the difference of the means of two normal poplations with known standard deviations?
18. Unbiased estimators need not be consistent. illustrate.
19. Explain how you will obtain a one-way classified data.

PART C

(Each question carries 5 marks. Maximum marks from this part is 20)

20. If $X_1, X_2, \ldots, X_n$ is a random sample from a Normal population N(μ,1). Show that $T = \frac{1}{n}\sum_{i=1}^{n} x_i^2$ is an unbiased estimator for 1+μ^2

21. Obtain the MLE of θ in the p.d.f. $f(x,\theta) = (1+\theta)x^2 \quad 0 < x < 1,$ based on a sample of size n. Examine whether the estimate is sufficient for θ

22. Samples of sizes two are drawn from a population with values 14,10,5,17,9,16,20,15. Suggest an unbiased estimate of the population mean and obtain its variance.

23. Describe the method of moment estimator.

24. What are the assumptions of a student's 't' test? Mention the applications of 't' test.

25. A sample of size 400 was drawn and the sample mean was found to be 99. Test whether this sample could have come from a normal population with mean 100 and variance 64 at 5% level of significance.

PART D

(Each question carries 10 marks. Maximum marks from this part is 30)

26. Two sample polls of votes for two candidates A and B are taken, one each from among the residents of rural and urban areas. The results are given in the following table. Examine whether the type of area is realted to voting preferences.

Area	Votes for A	Votes for B
Rural	620	380
Urban	550	830

27. (i) Describe the t test for testing the equality of two means stating the assumptions involved based on independent samples.
(ii) The Nicotine content in ml.gms of two samples of tobacco were found to be as follows. Test whether the population means are equal

Sample A : 24 27 26 21 25
Sample B : 27 30 28 31 22 36

28. The following table gives the number of mistakes per page observed in a book which follows Poisson distribution. Find an unbiased and consistent estimate of its parameter λ. Estimate its variance

No. of mistakes	0	1	2	3	4
No. of pages	211	90	19	5	0

29. A die is thrown 120 times with the following results. Test the hypothesis that the die is unbiased

Face	1	2	3	4	5	6
Frequency	20	18	22	30	16	14