



K25U 0850

Reg. No. :

Name :

**IV Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/
Improvement) Examination, April 2025
(2019 to 2023 Admissions)
CORE COURSE IN STATISTICS
4B04STA : Statistical Inference – 1**

Time : 3 Hours

Max. Marks : 48

**PART – A
(Short Answer)**

Answer **all** questions.

(6×1=6)

1. Define standard error.
2. What is the mean of the Chi-square distribution ?
3. What is an unbiased estimator ?
4. Give sufficient condition for consistency.
5. Define maximum likelihood estimator.
6. Define confidence interval.

**PART – B
(Short Essay)**

Answer **any 7** questions.

(7×2=14)

7. Obtain the moment generating function of Chi-square distribution.
8. Differentiate between estimator and estimate.
9. Let $X_1, X_2, X_3, \dots, X_n$ is a random sample drawn from $N(\mu, 1)$. Show that $t = \frac{1}{n} \sum_{i=1}^n X_i^2$ is an unbiased estimator of $\mu^2 + 1$.

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10. Obtain the MLE of β in $f(x) = (\beta + 1) x^\beta ; 0 < x < 1$.
11. Find 95% confidence interval of population proportion.
12. Write the mean and variance of the F-distribution.
13. What is Minimum Variance Unbiased Estimator (MVUE) ?
14. The diameter of cylindrical rods is assumed to be normally distributed with a variance of 0.04cm. A sample of 25 rods has a mean diameter of 4.5cm. Find 95% confidence limits for population mean.
15. What is meant by efficiency of an estimator ?

**PART – C
(Essay)**

Answer **any 4** questions.

(4×4=16)

16. Explain the interrelationships between Chi-square, t and F distributions.
17. What are the properties of a good estimator ?
18. Explain the method of maximum likelihood estimation of parameters. Write any two properties.
19. Describe the method of constructing confidence interval for the population mean of a normal population when the variance is unknown and sample size is small.
20. Let X_1, X_2 and X_3 be a random sample of size 3 drawn from a population with mean μ and variance σ^2 . Let T_1, T_2 and T_3 be three estimators of μ , where $T_1 = X_1 + X_2 - X_3 ; T_2 = 2X_1 + 3X_2 - 4X_3 ; T_3 = (X_1 + X_2 + X_3)/3$.
a) Examine whether T_1, T_2 and T_3 are unbiased estimators of μ .
b) Which estimator is most efficient ?
21. A sample poll of 100 voters in a given district indicated that 55% of them were in favor of a particular candidate. Find 95% and 99% confidence limits for the proportion.



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**PART – D
(Long Essay)**

Answer **any 2** questions.

(2×6=12)

22. Derive the sampling distribution of sample variance.
23. Let $X_1, X_2, \dots, X_n$ be a random sample from $f(x; \theta) = \frac{1}{\theta}, 0 < x < \theta$.
Examine whether $2\bar{X}$ is (a) Unbiased for θ (b) Consistent for θ (c) Sufficient for θ where $\bar{X} = \frac{1}{n} \sum X_i$.
24. Derive the confidence interval for population mean when (a) σ known (b) σ unknown.
25. Estimate the moment estimator of the parameter p of gamma distribution in $G(m, p)$. Also find the MLE of m when p is known.