

Roll No: _____
Date: ___/___/___

St. Claret College

Autonomous, Bengaluru

UG END SEMESTER EXAMINATION-NOVEMBER 2025

B.Sc. III SEMESTER

ST 325: STATISTICAL INFERENCE - I

12

TIME: 3 hours.

MAX. MARKS: 80



This paper contains TWO printed pages and FOUR parts

Instructions:

1. Verify and ensure that the question paper is completely printed.
2. Any discrepancies or questions about the exam paper must be reported to the COE within 1 hour after the examination.
3. Students must check the course title and course code before answering the questions.

PART-A

Answer ALL questions. Each answer carries ONE mark.

[1 x 10 = 10]

1. The sampling distribution of the sample mean has standard error equal to
a) σ b) σ/\sqrt{n} c) \sqrt{n}/σ d) n/σ
2. When the population variance is not known, which distribution is generally applied?
a) Normal b) t-distribution c) z-distribution d) Chi-square
3. In which of the following distributions are all odd moments equal to zero?
a) F-distribution b) Chi-square c) t-distribution d) Normal
4. The method of moments involves matching
a) Population and sample moments b) Sample means with variances
c) Totals with means d) Population variances with sample means
5. Chebyshev's inequality helps to demonstrate the concept of
a) Unbiasedness b) Convergence in probability c) Efficiency d) Sufficiency
6. If an estimator T is unbiased for parameter θ , then T^2 is
a) Unbiased for θ^2 b) Biased for θ^2 c) Consistent for θ^2 d) Sufficient for θ^2
7. An efficient estimator is one which
a) Has the least variance among unbiased estimators b) Is always consistent
c) Is always unbiased d) Equals the true parameter
8. CSO and NSSO in India primarily deal with
a) Taxation b) Economic planning c) Statistical data collection d) Census administration
9. A confidence interval gives
a) A likely range of values for a population parameter b) The exact parameter value
c) Only the point estimate d) Only the lower bound

10. A pivotal quantity is defined as
- A statistic whose distribution depends on unknown parameters
 - A statistic whose distribution is independent of unknown parameters
 - A constant random variable
 - A biased estimator

PART-B

Answer any TEN questions. Each answer carries TWO marks.

[2 x 10 = 20]

- Explain what is meant by a parameter and a statistic with an example.
- Define t -distribution and mention any one of its properties.
- What is meant by “degrees of freedom”?
- Write the definition of the likelihood function for a random sample.
- Describe briefly the method of moments.
- List any two desirable properties of a Maximum Likelihood Estimator.
- What is meant by the consistency of an estimator?
- Differentiate between point and interval estimation.
- What are the characteristics of a good estimator?
- Define the term “confidence coefficient.”
- A random sample of size **15** drawn from a normal population gives a mean of **5** and variance of **16**. Compute the 90% confidence limits for the population variance.
- State the meaning of convergence in probability in the context of estimators.

PART-C

Answer any FOUR questions. Each answer carries FIVE marks.

[5 x 4 = 20]

- Explain the Chi-square distribution and discuss its key properties and applications.
- Establish the relationship between the F and t distributions.
- Obtain the moment estimator for the parameter p of a Binomial distribution.
- State and prove Chebyshev’s Inequality and mention one use of it in estimation.
- Demonstrate that the sample mean is a consistent estimator of the population mean.
- Construct a 95% confidence interval for the mean of a normal population when σ is unknown and the sample size is large.

PART-D

Answer any THREE questions. Each answer carries TEN marks.

[10 x 3 = 30]

- Define population and sample.
 - Derive the relationship between the F and *Chi-square* distributions. (4+6)
- Using the method of moments, derive estimators for the mean and variance of a normal distribution.
- If T is an unbiased estimator of θ , show that T^2 is a biased estimator of θ^2 .
 - What do you mean by MVUE? (6+4)
- Prove that the sample variance is not an unbiased estimator of the population variance.
- Derive the formula for constructing a confidence interval for the proportion of success in a Binomial distribution.