

2056
Bachelor of Science (FYUP) Fourth Semester
Statistics
Paper : Statistical Inference
(Common with B.Sc. 4th Semester FYUP)

Time allowed: 3 Hours

Max. Marks: 60

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting one question from each Unit.

x-x-x

I. Attempt the following:-

- a) Define point estimator and estimate.
- b) What is a consistent estimator?
- c) Define sufficient statistic.
- d) State the Cramer–Rao inequality.
- e) Define Type-I and Type-II errors.
- f) What is a most powerful test?

(6x2)

UNIT - I

- II. a) Explain the properties of a good estimator. Discuss consistency, unbiasedness and efficiency with examples.
- b) Define sufficient statistic and explain the concept of minimal sufficiency with examples. (6,6)
- III. a) State and prove the Factorization Theorem. Explain its application in finding sufficient statistics.
- b) State and prove the Cramér–Rao Lower Bound (CRLB) and explain its importance in estimation theory. (6,6)

UNIT - II

- IV. a) Explain the method of maximum likelihood estimation and derive the MLE for the mean of a normal distribution.
- b) Compare Method of Moments and Maximum Likelihood Method of estimation. Discuss their merits and demerits. (6,6)

P.T.O.

(2)

- V. a) Explain interval estimation. Derive the confidence interval for the difference between two population means when population variances are known.
b) Explain the Method of Moments and obtain the estimators of parameters for a binomial distribution using this method. (6,6)

UNIT - III

- VI. a) Explain the principles of testing of hypothesis. Define null hypothesis, alternative hypothesis, level of significance and power of test.
b) Explain the concept of uniformly most powerful (UMP) tests with suitable examples. (6, 6)
- VII. a) State and prove the Neyman–Pearson Lemma and explain how it is used to construct the most powerful test.
b) Derive the most powerful test for the mean of a normal population when variance is known. (6,6)

UNIT - IV

- VIII. a) Explain the Likelihood Ratio Test. Use it to test the mean of a normal population.
b) Compare Sequential Probability Ratio Test (SPRT) with fixed sample size tests. (6, 6)
- IX. a) Explain Sequential Probability Ratio Test (SPRT). Discuss Operating Characteristic (OC) function and Average Sample Number (ASN).
b) Derive the expressions for the boundaries in SPRT. (6,6)

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