PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
MSc DEGREE EXAMINATION DECEMBER 2023
(Second Semester)

Branch – STATISTICS

ESTIMATION THEORY

Time: Three Hours   Maximum: 50 Marks

SECTION-A (5 Marks)
Answer ALL questions
ALL questions carry EQUAL marks   (5 x 1 = 5)

1. If $x_1, x_2...x_n$ be a random sample from $N(\mu, \sigma^2)$ population, the sufficient statistic for μ is ....

   (a) $\sum(x_i - \bar{x})^2$ (b) $\dfrac{\bar{x}}{n}$

   (c) $\sum x_i$ (d) $\sum(x_i - \bar{x})$

2. Cramer-Rao inequality with regard to variance of an estimator provides ......
   (a) upper bound on the variance   (b) lower bound on the variance
   (c) asymptotic variance of the estimator   (d) simply variance

3. In estimating the parameter of a linear function, most commonly used method of estimation is ....
   (a) maximum likelihood method   (b) least square method
   (c) method of minimum chi-square   (d) method of moments

4. Let $X_1, X_2, ...X_n$ be iid from $B(\theta)$. Then conjugate prior distribution of (θ) is
   (a) Gamma   (b) Beta first kind
   (c) Normd   (d) Gamma inverse

5. A confidence interval of confidence coefficient $(1-\alpha)$ is best which has ....
   (a) smallest width
   (b) vastest width
   (c) upper and lower limits equidistant from the parameter
   (d) one-sided confidence interval

SECTION - B (15 Marks)
Answer ALL Questions
ALL Questions Carry EQUAL Marks   (5 x 3 = 15)

6 a) Derive the sufficient condition for the consistency of an estimator θ_n.
   (OR)
   b) Explain the following (i) Sufficient (ii) Unbiasedness (iii) Consistency.

7 a) Establish Lehmann-Scheffe theorem. Explain the implications of the basic result.
   (OR)
   b) Develop the method of constructing minimal sufficient statistics.

8 a) Distinguish between MVUE and UMVUE.
   (OR)
   b) Explain the method of moments.

9 a) Compare the relationship between sufficient statistic and maximum likelihood estimator.
   (OR)
   b) Explain the location and scale invariant estimators.

10 a) Construct a $100(1 - \alpha)\%$ confidence interval for the population proportion based on large sample.

(OR)

b) Distinguish between interval estimation and point estimation.

SECTION -C (30 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks   (5 x 6 = 30)

11 a) Discuss the criteria of point estimation.

(OR)

b) Explain the properties of estimators.

12 a) State and prove the Cramer Rao inequality.

(OR)

b) State and prove Rao Blackwell theorem.

13 a) Explain the method of maximum likelihood estimator.

(OR)

b) Explain the minimum chisquare method and modified minimum Chisquare method.

14 a) Explain the method of Pittman estimator location of scale.

(OR)

b) Explain the concepts of Baye's estimator and posterior Baye's estimator.

15 a) The two random samples are drawn from the normal population.

Sample – I:	25	53	47	34	56	60	55	58
Sample – II:	55	45	58	60	70	50	43	69

Obtain the 95% and 99% confidence interval for difference between two means.

(OR)

b) Explain the concepts of shortest length confidence interval.

Z-Z-Z   END