PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 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 Factorisation theorem for sufficiency is known as:
(i) Rao-Blackwell theorem (ii) Crramer-Rao theorem
(iii) Chapman-Robins theorem (iv) Fisher-Neyman theorem

2 The lower bound for the variance of an estimator T_n under amended regularity conditions of Crammer-Rao was given by:
(i) R.A.Fisher (ii) A.Bhattacharyya
(iii) Silverstone (iv) Lehmann.E.L

3 Modified minimum Chi-square differs from minimum Chi-square with respect of:
(i) numerator of Chi-square statistic
(ii) denominator of Chi-square statistic
(iii) basic approach
(iv) Asymptotic approach

4 Which of the following statements is true?
(i) Bayes estimator is always a function of minimal sufficient statistics
(ii) Bayes estimators are most efficient
(iii) Bayes estimators are always asymptotically normal
(iv) Bayes estimators are most sufficient

5 Formula for obtaining 95% confidence limits for the mean μ of a normal population $N(\mu, \sigma^2)$ with known σ are:
$(i) -1.96 \leq \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} < 1.96$
$(ii) P\left[-Z_{\alpha/2} \leq \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \leq Z_{\alpha/2}\right] = 0.95$
$(iii)\ \bar{x} \mp 1.96\frac{\sigma}{\sqrt{n}}$
(iv) all the above

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

6 a What is point estimation and how it is differ form interval estimation?
OR
b Give the idea of minimal sufficient statistics.

7 a Obtain the minimum variance bound estimator for μ in normal population $N(\mu, \sigma^2)$ where σ^2 is known.
OR
b Obtain MVUE for θ, when the random sample $X_1, X_2 \ldots\ldots X_n$ taken from $U[0, \theta]$ population.

Cont...

8 a Estimate the parameters μ and σ^2 of normal distribution by the method of moments.

OR

b Write a note on modified minimum X^2 method.

9 a Write the concept of location invariant Estimators.

OR

b Give an account of the properties of Bayes estimator.

10 a Outline the method of constructing the confidence interval for large samples.

OR

b Explain the importance of unbiased confidence sets.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a State and prove sufficient condition for consistency.

OR

b Discuss completeness and bounded completeness with suitable illustration.

12 a State and prove Cramer-Rao inequality.

OR

b State and prove Rao-Blackwell theorem.

13 a Describe the method of maximum likelihood estimator.

OR

b How will you estimate the parameters of a distribution by the method of minimum- chi-square?

14 a Define Pitman's estimator for location and scale of a distribution. Also find mean of a normal population $N(\mu, 1)$

OR

b Distinguish location invariant estimator and scale invariant estimator.

15 a Obtain $100(1-\alpha)\%$ confidence intervals for the parameters a) θ b) σ^2 of the normal distribution.

OR

b Discuss i) Confidence bounds
ii) Uniformly most accurate confidence bounds.

Z-Z-Z END