ST JOSEPH'S UNIVERSITY, BENGALURU -27
M.Sc. (STATISTICS) – I SEMESTER
SEMESTER EXAMINATION: OCTOBER 2023
(Examination conducted in November /December 2023)
ST 7221: Theory of Point Estimation
(For current batch students only)

Time: 2 Hours   **Max Marks: 50**
This paper contains TWO printed pages and ONE part.

PART-A

I.   Answer any FIVE questions out of SEVEN questions:

1. A) Define k-parameter exponential family. Prove that Log-normal distribution with parameter (μ, σ^2) belongs to this family.
    B) Define consistency. Illustrate with an example an estimator which is both consistent and unbiased.   (5+5)

2. A) State the sufficient conditions for consistency. Obtain a consistent estimator when random samples are drawn from exponential distribution with mean θ.
    B) Define sufficient statistic and complete statistic.
    C) Obtain the minimal sufficient statistic when random samples are drawn from
       $U(\theta, \theta+1)$ distribution.   (3+2+5)

3. A) Define minimal sufficient statistic. If X_1 and X_2 are two random samples drawn from B(1, p) distribution then verify whether X_1+2X_2 is sufficient statistic for 'p' or not.
    B) Define efficiency of an estimator and Uniformly Minimum Variance Unbiased Estimator (UMVUE).
    C) Define Ancillary statistics and hence state Basu's theorem.   (5+3+2)

4. A) State and prove Rao-Blackwell theorem.
    B) Obtain the Fisher Information matrix for Normal distribution with parameters (μ, σ^2).
                                                                             (5+5)

5. A) State and prove Cramer-Rao Inequality.
    B) Derive a moment estimators of 'a' and 'b' when random samples are drawn from
       U(a, b).   (5+5)

6. A) Define Maximum Likelihood Estimation (MLE). Obtain the MLE of parameters (α, β) when random samples are drawn from Gamma distribution.
    B) Write a short note on Method of Newton Raphson and Method of Scoring.   (6+4)

7. A) Give any two advantages and disadvantages of moment method estimation.
   B) Write a short note on method of minimum Chi-square estimation.
   C) Construct UMVUE for p when the sample is drawn from $B(1, p)$ distribution.

(2+4+4)

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