Registration Number:

Date & Session:

ST JOSEPH'S UNIVERSITY, BENGALURU -27
M.Sc (STATISTICS) – 4th SEMESTER
SEMESTER EXAMINATION: APRIL 2024
(Examination conducted in May / June 2024)

ST 0120: Advanced Statistical Inference
(For current batch students only)

Time: 2 Hours **Max Marks: 50**

This paper contains TWO printed pages and ONE part.

PART-A

Answer any FIVE of the following **10 X 5 = 50**

1. A) Define marginal and jointly consistent estimators with an example.
   B) Define CAN estimator. Illustrate with an example an estimator which is consistent but not asymptotically normal.
   C) Define asymptotic relative efficiency (ARE). (3+6+1)

2. A) State and prove invariance property of consistent estimator.
   B) Write a short note on parametric and nonparametric bootstrap method. (6+4)

3. A) Write a note on Trimmed mean and Winsorized mean in robust estimation.
   B) Define influence curve and empirical influence curve.
   C) Define M-estimators. Obtain the limiting distribution of M-estimator. (4+2+4)

4. A) Define Quenouille's Jackknife Estimator.
   B) Explain Wald's Sequential Probability Ratio Test (SPRT).
   C) State and prove Wald's general lemma of SPRT. (2+3+5)

5. A) Explain the construction of SPRT procedure for Normal distribution with mean 'θ' and variance '1'.
   B) Define the following terms in SPRT:
      i. Operating characteristic function
      ii. Average sample number
      iii. Stopping time
      iv. Termination property (6+4)

6. A) If α and β are the probabilities of type I error and type II error of the SPRT with constants of termination A and B then prove that,
   $$A \leq \frac{(1-\beta)}{\alpha}$$
   B) Distinguish between parametric and non-parametric tests.

C) Explain the test procedure of Kolmogorov-Smirnov goodness of fit test for two samples. (2+3+5)

7. A) Define Run test and Sign test for one sample.
   B) Discuss the Mood's test for the two-sample scale problem.
   C) Explain the Mann Whitney Wilcoxon U test for testing equality of two distributions. (2+3+5)

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