25P255 (Pages: 2) Name: ....

Reg.No: ....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2026

(CBCSS - PG)

(Regular/Supplementary/Improvement)

CC22PMST2C06 - ESTIMATION THEORY

(Statistics)

(2022 Admission onwards)

Time : 3 Hours Maximum : 30 Weightage

Part-A

Answer any ***four*** questions. Each question carries 2 weightage.

1. Define Fisher Information.Let $x_1, x_2, \ldots, x_n$ be a random sample of 'n' observations from $N(0, \theta)$.Find Fisher information.
2. Let $x_1, x_2, \ldots, x_n$ be iid $N(\mu, \sigma^2)$ where $\sigma^2$is known. Check whether $T(x) = x_1 - x_2$ is ancillary statistics or not.
3. Define Fisher Information. Let $x_1, x_2, \ldots, x_n$ be a random sample of 'n' observations from $N(0, \theta)$. Find Fisher information.
4. Explain method of moment estimation. Prove or disprove: "Moments estimators are always unbiased".
5. Let $X \sim U(0, \theta)$.Find MLE for θ.
6. Explain bayesian method of estimation
7. What is meant by pivot in confidence estimation? Give an example.

(4×2 = 8 Weightage)

Part-B

Answer any ***four*** questions. Each question carries 3 weightage.

8. Define Joint Sufficient statistics and Factorisation theorem of joint sufficient statistics.
9. Define MVUE. What is the neccessary and sufficient condition for MVUE?
10. Define Cramer Rao inequality. Obtain the Cramer-Rao lower bound for variance of the unbiased estimator of μ, when a r.s of size 'n' is taken from $N(\mu, \sigma^2)$.
11. Show that $\dfrac{n\bar{x}}{n+1}$ is consistent for λ in the case of $P(\lambda)$.
12. Define CAN estimator. Let $x \sim exp(1/\theta)$. Show that $\bar{x}$ is CAN for θ.

13. Suppose $x_1, x_2, \ldots, x_n$ be a samples from $f(x,;\theta) = e^{-(x-\theta)}, x > 0, \theta > 0$ and the prior distribution of θ is $f(x) = e^{-\theta}, \theta > 0$. Determine the Bayes estimator of θ under sqaured error loss.

14. Derive the confidence interval for the parameter μ in $N(\mu, \sigma^2)$

(4 × 3 = 12 Weightage)

Part-C

Answer any ***two*** questions. Each question carries 5 weightage.

15. i) State and prove Cramer Rao Inequality.

    ii) Let $x_1, x_2, \ldots, x_n$ is a random sample from $exp(\theta)$. Find Cramer Rao Lower Bound for the variance of the unbiased estimate of θ.

16. i) State and prove invariance property of consistent estimator

    ii) Prove or disprove: "If T_n is a CAN estimator of θ then T_n^k is a CAN estimator of θ^k, k is a known positive integer."

17. Explain Cramer family. State and prove Cramer-Huzurbazar theorem.

18. Based on a sample drawn from $N(\mu, \sigma^2)$ with σ^2 is known, construct a $100(1-\alpha)\%$ C.I for μ.

(2 × 5 = 10 Weightage)

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