

24P254

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Name :

Reg. No :

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2025

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC19P MST2 C07 / CC22P MST2 C06 - ESTIMATION THEORY

(Statistics)

(2019 Admission onwards)

Time: 3 Hours

Maximum: 30 Weightage

Part-A

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

1. Define sufficiency. State and prove factorization theorem for sufficiency.
2. Explain one parameter exponential family of distributions. Prove that geometric distribution distribution is a member of one parameter exponential family.
3. Define Fisher Information. Discuss the role of Fisher Information in Statistics.
4. Explain the method of moment for estimation of parameters.
5. Explain M.L.E. method. Give an example to prove that MLE are not unbiased.
6. Define loss function and risk function in decision theory.
7. Let $X \sim U(0, \theta)$. Obtain an unbiased C.I for θ .

(4 × 2 = 8 Weightage)

Part-B

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

8. For a random sample of size 'n' from Beta distribution with parameters α and β . Find joint sufficient statistics for α and β .
9. A random sample of $x_1, x_2, \dots, x_n$ is taken from $N(0, \sigma^2)$. Find MVBE of σ^2
10. Define Cramer Rao Lower Bound. Find Cramer-Rao lower bound for variance of the unbiased estimator of θ with $f(x; \theta) = \theta(1 - \theta)$, $x = 0, 1, 2, \dots$, and $0 < \theta < 1$.
11. Let $x_1, x_2, \dots, x_n$ be i.i.d observations from $P(\lambda)$. Find a consistent estimator of $e^{-\lambda}$.
12. 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.
13. Explain Cramer family.
14. Explain Shortest length confidence interval .

(4 × 3 = 12 Weightage)

Part-C

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

15. i) State and prove Rao-Blackwell theorem
ii) Let $x_1, x_2, \dots, x_n$ be a random sample from $N(\theta, 1)$. Find the UMVUE of θ and θ^2 .
 16. i) If $f(x) = \theta x^{\theta-1}, 0 < x < 1, \theta > 0$. Find the moment estimator of θ
ii) Define CAN estimator. Give an example.
iii) Find moment estimator of parameters of Gamma distribution.
 17. Give an example to prove that a family which is not an exponential family but is a Cramér family.
 18. i) Define a) Shortest expected length confidence interval b) Fiducial interval.
ii) Describe the construction of $100(1 - \alpha)\%$ C.I for mean of normal population with known variance.
- (2 × 5 = 10 Weightage)**
