LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

FIFTH SEMESTER – **NOVEMBER 2013**

ST 5504/ST 5500 – ESTIMATION THEORY

Date : 05/11/2013 Dept. No. Max. : 100 Marks
Time : 9:00 - 12:00

PART - A

Answer all the **TEN** questions: (10 x 2 = 20)

1. Define Parameter space.
2. Define Unbiasedness.
3. What do you mean by sufficiency?
4. What is Minimum Variance Unbiased Estimator?
5. Define Likelihood function.
6. Define the Method of Moments.
7. What do you understand by Prior Distribution?
8. Define Linear Models.
9. Define BLUE.
10. Define Efficiency.

PART - B

Answer any **FIVE** questions: (5 x 8 = 40)

11. Describe about the concept of “Estimation Theory”
12. Prove that in sampling from a $N(\mu, \sigma^2)$ population, the sample mean is a consistent estimator of μ.
13. Find the method of moments estimator for Gamma distribution with two parameters.
14. State and prove Cramer’s Rao Inequality.
15. Explain in detail about the least square estimate for linear models.
16. If T_1 and T_2 be two unbiased estimators of $\gamma(\theta)$ with variances σ_1^2, σ_2^2 and correlation of ρ, what is the best unbiased linear combination of T_1 and T_2 and what is the variance of such a combination?
17. Explain the properties of MLE.
18. Obtain the MVB estimator for μ in normal population $N(\mu, \sigma^2)$, where σ^2 is known.

PART - C

Answer any TWO questions: (2 x 20 = 40)

19. a) State and prove Rao – Blackwell theorem.

    b) An M.V.U is unique in the sense that if T_1 and T_2 are M.V.U. estimators for $\gamma(\theta)$, then $T_1 = T_2$, almost surely.

20. a) X_1 , X_2 and X_3 is a random sample of size 3 from a population with mean value μ and variance σ^2. T_1, T_2 , T_3 are the estimators used to estimate mean value μ, where $T_1 = X_1 + X_2 - X_3$, $T_2 = 2X_1 + 3X_3 - 4X_2$ and $T_3 = (\lambda X_1 + X_2 + X_3)/3$.

i) Are T_1 and T_2 unbiased estimators?

ii) Find the value of λ such that T_3 is unbiased estimator for μ.

iii) Find which one is the best estimator?

b) Show that If a sufficient estimator exists, it is a function of the Maximum Likelihood Estimator.

21. a) In random sampling from normal population $N(\mu, \sigma^2)$, find the maximum likelihood estimators for (i) μ when σ^2 is known.

(ii) σ^2 when μ is known.

b) State and prove the necessary and sufficient conditions for parametric function to be linearly estimable.

22. a) Explain the concept of Method of Least squares.

b) Let X_1 , X_2 …….. X_n be a random sample from Bernoulli distribution $b(1,\theta)$. Obtain the Bayes estimator for θ by taking a suitable prior.

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