 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **STATISTICS**

SECOND SEMESTER – APRIL 2012

# ST 2811 / 2808 - ESTIMATION THEORY

Date : 17-04-2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**SECTION – A**

**Answer all the Questions: (2x10=20 Marks)**

1. State the Methods of Obtaining UMVUE
2. State the Invariance Property of MLE
3. State Neyman-Fisher Factorization Theorem
4. Provide an example to prove that an unbiased estimator need not be unique
5. Define Sufficient Statistic and Provide an Example
6. Define Bayesian Estimator
7. State the use of Rao-Blackwell Theorem
8. Define T-Optimality
9. Provide the large sample behavior of Maximum Likelihood Estimator
10. Define Best Linear Unbiased Estimator

**SECTION – B**

**Answer any Five Questions: (5x8=40 Marks)**

1. State and Prove the necessary and sufficient condition for unbiased estimator to be UMVUE
2. State and Prove Cramer-Rao Inequality for Multi-parameter case and hence

establish the inequality for the case of single parameter

1. State and Prove Neyman-Fisher Factorization theorem
2. Let X1,X2,...,Xn be a random sample of size n from uniform distribution U(0,θ),

Y=max{ X1,X2,...,Xn} show that is an Unbiased Estimator of θβ. Where β is a

positive constant

1. State and Prove Rao-Blackwell Theorem.
2. Let Y1,Y2,Y3,Y4 be random variable with E(Y1) = E(Y2)= θ1+ θ2 , E(Y3) = E(Y2)= θ1+ θ3 determine the estimability of the following linear parametric functions

i) 2θ1+ θ2+ θ3 ii) θ3-θ2 iii) θ1 iv) 3θ1+ θ2+2 θ3

1. Let X1,X2,...,Xn be a random sample of size n from N(μ,σ2) obtain (1-α)%

confidence interval for σ2 using the large sample behavior of MLE

18. Find the Bayes Estimator of parameter p of a Binomial Distribution with X successes

out of n trials given that the prior distribution of p is a Beta distribution with

parameter α and β.

**SECTION – C**

**Answer any two questions: (2x20=40Marks)**

19. i. Establish: If UMVUE exists for a parametric function , It must be essentially

unique.

ii. Obtain UMVUE of θ(1-θ) using a random sample of size n from B(1,θ).

1. i. Let X1,X2,…,Xn be a random sample from N(µ,σ2). Find Cramer-Rao lower bound for

estimating a) µ b) σ2 c) µ+ σ d) 

ii. Define Consistent Estimator and Establish the sufficient condition for Consistency.

1. Establish: δ\*Ug is QA-Optimal if and only if each component of δ\* is UMVUE.
2. i. Let X1,X2,...,Xn be a random sample from N(μ,σ2),μR, σ2>0. Obtain MLE of (μ,σ2)

ii. Explain Bootstrap and Jackknife Methods.

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