LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FIFTH SEMESTER – NOVEMBER 2007

ST 5500 - ESTIMATION THEORY

BB 16

Date : 24/10/2007 Dept. No. Max. : 100 Marks
Time : 9:00 - 12:00

SECTION – A

(10 x 2 = 20 marks)

Answer ALL the questions.

1. Define unbiased estimator. Give an example.
2. State any two regularity conditions.
3. Define a sufficient estimator.
4. State any two properties of UMVUE.
5. Describe the Method of Moment estimation.
6. State any two properties of maximum likelihood estimators.
7. Describe the concept of posterior distribution.
8. Define risk function.
9. Describe the method of least squares.
10. State any two assumptions of Gauss-Markov model.

SECTION – B

Answer any FIVE questions. (5 x 8 = 40 marks)

11. Derive an Unbiased estimator of λ in a Poisson distribution, based on a random sample of size n.
12. Let $\{T_n\}, n=1,2,......n$ be a sequence of estimators such that $\lim\limits_{n\to\infty} E_\theta(T_n)=\psi(\theta)$ and $\lim\limits_{n\to\infty} V_\theta(T_{n)}=0\ \forall\theta\in\theta$. Then show that T_n is consistent for $\psi(\theta)$.
13. If X_1, X_2, X_3 ………. X_n is random sample of form $B(1,(1,\theta),\ \theta\in(0,1),$ then show that $\sum_{i=1}^{n} X_i$ is a sufficient statistic for θ.
14. Show that the family of Poisson distributions $\{P(\lambda),\lambda>0\}$ is complete.
15. State and prove Lehmann Scheffe theorem.
16. Given a random sample from
17. If $\hat{\theta}$ be MLE of θ and if g is a one – one function, show that g($\hat{\theta}$) is MLE of g(θ).
18. Show that a necessary and sufficient condition for the linear parametric function $l\beta$ to be linearly estimable is that Rank(A) = Rank $\begin{pmatrix} A \\ l \end{pmatrix}$, where A is the known coefficient matrix of the model.

SECTION – C

(2 x 20 = 40 marks)

Answer any TWO questions.

19. a) State and prove Cramer-Rao inequality. [12]
    b) Show that the family of the Binomial distributions $\{B(n,\theta),\ \theta\in(0,1),$ n- known} is complete [8]
20. a) Show that UMVUE of a parametric function is unique. [10]
    b) If T is a sufficient statistic then prove that MLE is a function of T [10]
21. a) Explain the concept of estimation by the method of minimum chi-square.[8]
    b) If X_1, X_2, X_3, ……….. X_n is a random sample from $U(\alpha,\beta),\alpha<\beta,\alpha,\beta\in R,$ then obtain MOM estimators of α and β. [12]
22. Explain: i) Bayes Estimation ii) Factorization theorem
    iii) Bounded Completeness iv) BLUE [4x5]

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