LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – **APRIL 2015**

ST 4503/ST 5504/ST 5500 - ESTIMATION THEORY

Date : 16/04/2015 Dept. No. Max. : 100 Marks
Time : 09:00-12:00

PART – A

Answer **ALL** questions: **(10x2=20 Marks)**

1. Define unbiased estimator.
2. Define consistent estimator.
3. Write any two properties of ML estimators.
4. Define a sufficient statistic.
5. What properties the minimum Chi-square estimators hold?
6. Explain the method of moments.
7. Suggest an unbiased estimator for the parameter of U(0,θ).
8. Define prior distribution.
9. The mean height of a random sample of 60 students is 145 with a SD of 40. Find the 95% confidence limits for the population mean assuming normality.
10. Define confidence interval.

PART – B

Answer any **FIVE** questions: **(5x8=40 Marks)**

11. If T_n is consistent for θ and g is continuous, show that $g(T_n)$ is consistent for g(θ).
12. Find maximum likelihood estimators of the normal parameters μ and σ^2.
13. State and prove Rao-Blackwell theorem.
14. Describe the method of modified minimum chi-square in estimation of parameters.
15. Explain the construction of confidence interval for the variance of a normal population when μ is unknown.
16. Write the properties of maximum likelihood estimator.
17. Distinguish between prior and posterior distributions.
18. Given a random sample of size n from $N(\mu,1), \mu \in R$ construct $100(1-\alpha)\%$ confidence interval for μ.

PART – C

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

19. (a) Establish the uniqueness of MVU estimator.
    (b) State and prove factorization theorem on sufficient statistic.
20. (a) State and prove Chapman – Robbins inequality.
    (b) Show that maximum likelihood estimator is a function of sufficient statistic.
21. (a) State and prove Lehman –Scheffe theorem.
    (b) If $X_1, X_2, ...X_n$ is random sample from a population with p.d.f. $f(x) = e^{-(x-\theta)}, x > \theta$; $= 0$ *otherwise*.
    Obtain an unbiased estimator of θ.
22. (a) Construct a $100(1-\alpha)\%$ confidence interval for the difference between means of two independent normal populations having common but unknown variance.
    (b) Define completeness. Show that if $X_1, X_2, ...X_n$ is a random sample from B(1,p) then $\sum_{i=1}^{n} X_i$ is complete.

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