LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH & FIFTH SEMESTER – **APRIL 2018**

ST 4503 / ST 5504-ESTIMATION THEORY

PART A

Date: 08-05-2018 Time: 01:00-04:00

Answer **ALL** the questions:

1. Distinguish between point estimation and interval estimation.

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- 2. Define unbiased estimator. Give example.
- 3. Explain sufficient estimator.
- 4. Let X_1, X_2 denote a random sample from Poisson distribution with parameter λ . Obtain sufficient statistics.
- 5. State any two properties of Maximum Likelihood Estimators.
- 6. Describe the method of least square estimation.
- 7. Explain Posterior distribution.
- 8. What is Baye's estimator?
- 9. Describe the general method of constructing confidence interval.
- 10. Obtain $100(1 \alpha)$ % confidence interval for the variance, if a random sample of size n is drawn from normal population with known mean.

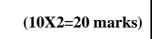
PART B

Answer any **FIVE** questions:

- 11. Obtain any two unbiased estimators for the population mean in the case of normal distribution.
- 12. Show that minimum variance unbiased estimator is unique.
- 13. Let $X_1, X_2, ..., X_n$ be a random sample of size n from $N(\mu, \sigma^2)$; $\mu \in R$, $\sigma > 0$. Find sufficient

estimators of μ and σ^2 .

- 14. State and prove Lehmann-Scheffe theorem.
- 15. Describe method of moment estimation.



Max.: 100 Marks

(5X8=40 marks)

16. Distinguish between prior and posterior distribution.

17. Define Loss function and Risk function with an example for each.

18. Obtain the MLE of λ in the case of Poisson distribution based on a random sample of size n.

PART C

Answer any **TWO** questions:

19. a. State and prove Cramer-Rao inequality.

b. Obtain the Cramer – Rao lower bound for the unbiased estimator of λ in the case of Poisson

distribution

20. a. State and establish Rao Blackwell theorem.

b. If $X_1, X_2, ..., X_n$ is a random sample from Bernoulli distribution

$$f(x; \theta) = \begin{cases} \theta^x (1-\theta)^{1-x} & x = 0, 1, 0 < \theta < 1\\ o.w. \end{cases}$$

Then show that $\sum_{i=1}^{n} X_i$ is complete for θ .

21. a. Explain the method of maximum likelihood.

b. Let $X_1, X_2, ..., X_n$ be a random sample from $f(x; \theta) = \begin{cases} \theta e^{-\theta x} & x > 0, \ \theta > 0 \\ 0 & o.w. \end{cases}$

Estimate θ using method of moments.

22. a. Construct 100 $(1 - \alpha)$ % confidence interval for themeans of a independent normal population whose variance is known.

b. Let $X \sim b(n, p)$ and $L(p, \delta(x)) = (p - \delta(x))^2$. Let $\pi(p) = 1$ for o be the prior PDF of <math>p. Find Bayes estimator.

(2X20=40 marks)