LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **NOVEMBER 2019**

16/17/187UST3MC02 – ESTIMATION THEORY

Date: 31-10-2019 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

SECTION – A

Answer **ALL** questions. **10 X 2 = 20**

1. Define parameter and parameter space. Give an example.
2. State the Cramer-Rao lower bound.
3. Define Complete statistic. Give an example.
4. If $X_1, X_2, X_3 .... X_n$ are random samples from N(µ,10). Suggest a sufficient statistic for the family.
5. Describe the Method of Minimum Chi-square estimation.
6. State the Least Square estimators of $_0$ and $_1$, in the model $Y = {}_0 + {}_1 X + £$
7. Define Loss function. Give an example.
8. Define conjugate prior. Give an example.
9. Describe confidence intervals and their applications.
10. State the 95% confidence interval for « , when a random sample of size 'n' is drawn from N(« ,10).

SECTION – B

Answer Any **FIVE** questions. **5 X 8 = 40**

11. Derive an unbiased estimator of µ, when a random sample of size 'n' is drawn from N(« ,5).
12. State and prove Cramer-Rao inequality.
13. Define UMVUE and prove that it is unique, when it exists.
14. Derive a sufficient statistic of a in a Poisson distribution, based on a random sample of size 'n'.
15. If $X_1, X_2, X_3 .... X_n$ is random sample of form a Normal distribution N$\left(«, ±^2\right)$, « known, derive a sufficient statistic for $±^2$ using Neyman Factorization theorem.
16. Describe Bayes estimation with suitable example.
17. Let $X_1, X_2, X_3, ... X_n$ be a random sample from Binomial(m, ¯) , ¯ ∈ (0,1),
    m-known and let Beta(~ ,) be the prior distribution for ¯ . Find the
    Bayesian estimator for ¯ .
18. Describe Method of Moments estimation with suitable example.

SECTION – C

<u>Answer any **TWO** questions</u>. **2 X 20 = 40**

19. a. Define a consistent estimator. Find the same for parameter p, based on a random sample of size n from Binomial distribution with parameters n and p. **[12]**

 b. State any four properties of MLE **[8]**

20. a. State and prove Lehmann- Scheffe theorem. **[10]**

 b. Derive Method of Moments estimator for ~ , based on a random sample of size n from Uniform distribution U(0, ~) . **[10]**

21. a. State and prove Rao-Blackwell theorem. **[12]**

 b. Describe method of Modified Minimum Chi-square estimation. **[8]**

22. a. Let {T $_n$ }, n = 1, 2, …..n be a sequence of estimators such that

$\lim_{n\to\infty} E(T_n) = \cdot\,(\bar{\ })$ and $\lim_{n\to\infty} V(T_n) = 0 \quad \forall \bar{\ } \in \Theta$ .Then show that T_n is consistent for $\cdot\,(\bar{\ })$.

[10]

 b. Obtain the confidence interval for (i). single proportion and (ii). difference of proportions

[10]

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