LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **APRIL 2019**

16/17UST3MC02– ESTIMATION THOERY

Date: 25-04-2019 Dept. No. Max. : 100 Marks
Time: 01:00-04:00

PART - A

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

1. What is point estimation?
2. Define unbiased estimator of a parametric function. Give an example.
3. What is Completeness of an estimator?
4. Define UMUVE.
5. Write any four methods for estimating a parameter.
6. State the Least squares Estimator of β_0 in the model $Y = \beta_0 + \beta_1 X + \varepsilon$.
7. What is the role of prior distribution?
8. Give an unbiased estimator for θ in the case of $U(0, \bar{\ })$ using a random sample.
9. Describe Confidence Intervals.
10. State the 95% confidence interval for μ based on a random sample of size n from N(μ, 1).

PART – B

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

11. Let $x_1, x_2, \dots, x_n$ be a random sample from a normal population N(μ,1). Show that $T = \frac{1}{n}\sum_{i=1}^{n} x_i^2$ is an unbiased estimator of μ^2+1.
12. Explain the concept of consistent estimator and also show that in sampling from a $N(\mu,\sigma^2)$ population, the sample mean is a consistent estimator of μ.
13. Write down the properties of sufficient statistic.
14. State and prove Neymann – Fisher factorization theorem.
15. Explain the concept of the method of least square.
16. Describe the invariance property of MLE, what is the MLE of e^{θ} in the case of binomial $b(1, \bar{\ })$ using a random sample.
17. Explain about the Bayes' estimator.
18. Given a random sample of size n from $N(\mu, \sigma^2), \mu \in R$. Construct 100(1-α)% confidence interval for μ when σ^2 is known.

PART – C

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

19. a) State and prove Cramer – Rao inequality. **(12)**
    b) Show that the family of Poisson distributions {P(λ), λ > 0} is complete. **(8)**
20. a) State and prove Rao – Blackwell theorem. **(10)**
    b) If UMUVE exists, Show that UMUVE is unique. **(10)**
21. a) Show that maximum likelihood estimator is a function of sufficient statistic. **(8)**
    b) Obtain the moment estimators of the parameters of $U(\theta_1, \theta_2)$, $\theta_1, \theta_2 \in R$ **(12)**
22. a) Define prior and posterior distributions with suitable notations. Define Bayes Risk of an estimator and obtain two different expressions for it. **(10)**
    b) Obtain 100(1-α)% confidence limits for the difference of means in sampling from two normal populations. **(10)**

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