



Date: 16-06-2022

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

**PART – A**

**Answer ALL the Questions.**

**(10 x 2 = 20 Marks)**

1. Define Parameter and Statistic.
2. When is an estimator said to be Consistent?
3. Define Sufficient Statistic.
4. How will you find efficiency in estimation?
5. Define UMVUE.
6. What do you understand by completeness of family of distributions?
7. Define Least square estimator.
8. Define Posterior Distributions.
9. What is Interval estimation?
10. Define Confidence limits.

**PART – B**

**Answer Any FIVE Questions.**

**(5 x 8 = 40 Marks)**

11. State and prove the sufficient condition for an estimator to be consistent.
12. Let  $X_1, X_2, \dots, X_n$  be a random sample from a uniform population on  $[0, \theta]$ . Find a sufficient estimator for  $\theta$ .
13. State and prove Lehmann Scheffe theorem.
14. Describe the method of moments. Find method of moment estimators of the normal parameters  $\mu$  and  $\sigma^2$ .
15. Define Confidence limits. Obtain  $100(1 - \alpha)\%$  confidence interval for difference between means.
16.  $X_1, X_2$  and  $X_3$  is a random sample of size 3 from a population with mean value  $\mu$  and variance  $\sigma^2$ .  $T_1, T_2, T_3$  are the estimators used to estimate mean value  $\mu$ , where  $T_1 = X_1 + X_2 - X_3, T_2 = 2X_1 + 3X_3 - 4X_2$  and  $T_3 = \frac{1}{3}(\lambda X_1 + X_2 + X_3)$ 
  - (i) Are  $T_1$  and  $T_2$  unbiased estimators?
  - (ii) Find the value of  $\lambda$  such that  $T_3$  is unbiased estimator for  $\mu$ .
17. Let  $X_1, X_2, \dots, X_n$  denote a random sample from the Bernoulli density  $f(x/\theta) = \theta^x(1-\theta)^{1-x}$  for  $x=0,1$ , Assume that the prior distribution is uniformly distributed over the interval  $(0,1)$ . Find the posterior Bayes estimator of  $\theta$ .
18. State and prove factorization theorem.

**PART – C**

**Answer Any TWO Questions.**

**(2 x 20 = 40 Marks)**

19. (a) State all the properties of M.L.E. **(10 Marks)**
- (b) State and Prove Cramer Rao Inequality. **(10 Marks)**
20. (a) Let  $X_1, X_2, \dots, X_n$  be a random sample from Bernoulli distribution **(10 Marks)**
- $f(x, \theta) = \theta^x (1 - \theta)^{1-x}; x=0,1$   
Find the complete sufficient statistic for  $\theta$ .
- (b) Derive the asymptotic confidence interval for proportion. **(10 Marks)**
21. (a) State and prove Rao Blackwell theorem. **(10 Marks)**
- (b) Prove that for Cauchy's distribution not sample mean but sample median is a consistent estimator of the population mean. **(10 Marks)**
22. (a) Obtain Confidence interval for ratio of variances of two normal populations. **(10 Marks)**
- (b) Write short notes on (i) Mean-square Error (ii) Biased estimators. **(10 Marks)**

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