ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE – 27

B.Sc STATISTICS – III SEMESTER

SEMESTER EXAMINATION – OCTOBER 2019

ST 318 –STATISTICAL INFERENCE – I

Time: 2½hrs   **Max:70 Marks**

This question paper has **TWO** printed pages and **THREE** parts

SECTION – A

I   Answer any FIVE of the following: **5x 3= 15**

1. Define Power series family of distribution? Give any two distributions which are members of power series family

2. Distinguish between estimator and estimates?

3. State Neymann- Factorization theorem

4. Explain the procedure of estimating parameters using method of moments

5. Define Confidence Interval and Confidence Coefficient

6. What is P-value? How is it useful?

7. Define Size of a test. How level of significance is different from size of the test?

SECTION – B

II   Answer any FIVE of the following: **5 x 7 = 35**

8. A) Derive the maximum likelihood estimator probability of success, for Negative binomial distribution number of successes is equal to 5.

   B) What are the criteria of a good estimator?   (5+2)

9. A) Explain different types of estimators in Inferential Statistics

   B) Derive the expression for mean square error of an estimator   (4+3)

10. A) Let $X_1, X_2 \ldots X_n$, be a random sample from Geometric(p),verify whether sample mean, $\overline{X}$ is consistent estimator of p or not

    B) Distinguish between simple hypothesis and composite hypothesis.   (5+2)

11. A) Explain invariance property of maximum likelihood estimator with an example

    B) Give the confidence interval for population variance   (5+2)

12. For a random sample of size 45 from $N(\mu, \sigma^2)$ where $\sigma^2 = 16$, then for
    $H_0: \mu = 2$ against $H_1: \mu = 4$, most powerful test is given by

$$\phi(\Sigma x) = \begin{cases} 1 \ if \ \Sigma x > k \\ 0 \ if \ \Sigma x \leq k \end{cases}$$

   A) Determine k such that size of the test is 5% $(Z_{\frac{\alpha}{2}} = 1.96)$

   B) Obtain an expression for power of above test   (5+2)

13. A) What are the different types of errors involved in testing? Explain with an example

   B) Define Minimum Variance Unbiased Estimator   (5+2)

14. A) Derive the confidence interval for ratio of two population variances.

   B) Give the confidence interval for population proportion   (5+2)

SECTION – C

III   **Answer any TWO of the following:**   **2 x 10 = 20**

15. A) Define maximum Likelihood Estimator. Suppose that $X_1, \cdots, X_n$ form a random sample from a uniform distribution on the interval $(0, \theta)$, where of the parameter $\theta > 0$ but is unknown. Derive MLE of θ.

   B) Explain the steps involved in testing of a hypothesis   (6+4)

16. A) If X~Poisson (λ). Obtain an unbiased estimator for parameter λ

   B)Let $X_1, X_2....X_n$ be a random sample from N (μ_0, σ^2) then obtain the most powerful test for testing $H_0: \sigma = \sigma_0$ v/s $H_1 : \sigma = \sigma_1$ $(\sigma_0 > \sigma_1)$ (4+6)

17. A) Obtain $100(1 – \alpha)$ % confidence interval for population mean when population variance unknown

   B) What do you mean by Single Parameter Exponential family? Prove that Binomial distribution with parameters (n = 15, & p) belongs to Single Parameter Exponential family.

   C) State the sufficient conditions for consistency   (4+4+2)