



Register Number:

Date:

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

**B.Sc STATISTICS – III SEMESTER**

**SEMESTER EXAMINATION – OCTOBER 2019**

**ST 318 – STATISTICAL INFERENCE – I**

**Time: 2½ hrs**

**Max: 70 Marks**

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

**SECTION – A**

**I Answer any FIVE of the following:**

**5 x 3 = 15**

1. Define estimator and estimate with an example.
2. Define consistent estimator and mention its invariance property.
3. If  $T$  is an unbiased estimator for  $\theta$ , prove that  $T^2$  is biased estimator for  $\theta^2$ .
4. Mention any three properties of maximum likelihood estimator
5. Define confidence interval and confidence coefficient.
6. Differentiate between simple and composite hypotheses
7. State Neyman -Pearson lemma.

**SECTION – B**

**II Answer any FIVE of the following:**

**5 x 7 = 35**

8. A) Let  $X_1, X_2, \dots, X_n$ , be a random sample from  $\text{Exp}(\theta)$ , obtain sufficient statistic for  $\theta$ . (4)  
B) Show that Poisson distribution belongs to Power series family. (3)
9. A) Consider a random sample of size  $n$  from Geometric ( $\theta$ ). Compare following estimators using mean square error criterion  
(i)  $T_1 = \frac{\sum x}{n}$  (ii)  $T_2 = \frac{\sum x}{n-1}$  (4)  
B) Define efficient estimator. Show that if  $T_1$  and  $T_2$  are 2 independent estimator of  $\theta$  then  $T_1+T_2$  is less efficient than  $T_1$  (3)
10. Let  $X_1, X_2, \dots, X_n$ , be a random sample from Poisson with mean  $\theta$ .  
Obtain the maximum likelihood estimator for  $P(X=0)$  (7)
11. A) Let  $X_1, X_2, \dots, X_n$ , be a random sample from  $U(a, b)$ . Find the moment estimator of  $a$  and  $b$ . (5)  
B) Distinguish between parameter and statistic. (2)

12. A) Obtain  $100(1 - \alpha)\%$  confidence interval for the unknown parameter  $\mu$  of normal population when  $\sigma$  is unknown. (4)
- B) Explain Pivotal Quantity method of constructing confidence interval. (3)
13. A) Define following terms (5)
- (i) p-value
  - (ii) Level of significance
  - (iii) Null and alternative hypothesis.
- B) Define non randomized test. (2)
14. A) Briefly explain types of errors involved in testing of hypotheses with an example (4)
- B) Define critical region with neat diagram (3)

### SECTION – C

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

15. (A) State Neyman Factorization theorem. (2)
- (B) If,  $X \sim B(1, P)$ , verify whether  $\overline{X}_n$  consistent for P. (5)
- (C) Define maximum likelihood method of estimation (3)
16. A) Derive  $100(1 - \alpha)\%$  confidence interval for correlation coefficient. (5)
- B) Derive  $100(1 - \alpha)\%$  confidence interval for population variance, when  $X \sim N(\mu, \sigma^2)$  where  $\mu$  is unknown (5)
17. A) Derive a most powerful test for testing  $H_0: \mu = \mu_0$  against  $H_1: \mu = \mu_1$ , (7)  
 $\mu_1 > \mu_0$ , when  $X \sim N(\mu, \sigma^2)$  where  $\sigma^2$  is unknown.
- B) Define power of the test and obtain an expression for it (3)