Register Number:

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

B.Sc. STATISTICS – III SEMESTER

SEMESTER EXAMINATION – NOVEMBER 2020

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: **5 x 3= 15**

1. Differentiate between statistic and parameter. Give an example for each.
2. What do you mean by invariance property of an estimator? Mention its application.
3. Define relative efficiency of an estimator. Mention its range.
4. Define likelihood function and obtain an expression for log-likelihood function for geometric distribution
5. Define Confidence Interval and Confidence Coefficient
6. Define size of a test. How level of significance is different from size of the test?
7. What is p-value? How is it useful?

SECTION – B

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

8. A) Examine whether sample variance $s^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i-\bar{x})^2$ is an unbiased estimator of population variance σ^2, when a sample is drawn from N (μ,σ^2).
   B) What are the criteria of a good estimator? (5+2)

9. A) Obtain the relationship between mean square error and variance of an estimator
   B) Let $x_1, x_2, \ldots, x_n$ be the random sample of size n from Bernoulli distribution with parameter p. Examine whether $\bar{X}$ is a consistent estimator for p or not. (3+4)

10. A) Prove that Binomial distribution belongs to one parameter exponential family.
    B) Distinguish between simple hypothesis and composite hypothesis. (5+2)

11. A) Explain the procedure to obtain the maximum likelihood estimator.
    B) Derive moment estimators of a and b for U(a, b). (4+3)

12. A) Explain the Pivot method for finding the confidence interval.

B) What happens to the confidence interval when confidence level α increases? (5+2)

13. A) Write down the confidence interval for proportion and explain the notations

B) Derive 100(1 - α) % level of significance confidence interval for population mean when σ is unknown (2+5)

14. A) Explain the types of errors involved in testing of hypothesis problem with an example. Deduce relation between type II error and power

B) Define test function (5+2)

SECTION – C

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

15. A) Let $x_1, x_2, \ldots, x_n$ be the random sample of size n from Poisson with parameter θ. Examine whether $\bar{X}$ is a MVUE or not. (7)

B) Write down formula for 100(1-α) % confidence interval for the difference between two population means (Consider independent case only) (3)

16. A) Suppose that $x_1, x_2, \ldots, x_n$ from a random sample from a geometric distribution with parameter θ . Derive maximum likelihood estimator of θ. (5)

B) Briefly explain the general procedure for testing of hypotheses (5)

17. A) Define most powerful test (3)

B) Derive the most powerful test for testing $H_0: \mu = \mu_0$ against $H_1: \mu = \mu_1, \mu_0 > \mu_1$ when $X \sim N(\mu, \sigma^2)$ where σ^2 is known. (7)