**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU-27**

B.Sc. STATISTICS – III SEMESTER

SEMESTER EXAMINATION: OCTOBER 2021

(Examination conducted in March 2022)

**ST - 318: Statistical Inference I**

**Time: 2½ Hours Max: 70 Marks**

*This question paper contains* ***Two*** *printed pages and* ***Three*** *parts*

**PART A**

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

1. Define power series family of distribution? Give two examples
2. Distinguish between Point estimation and Interval estimation
3. Give the procedure of method of moment estimation
4. Mention the properties of maximum likelihood estimators
5. Give the confidence interval for differences between two population proportions. Explain the notations used
6. A researcher is studying the effects of radical exercise program on knee surgery patients. There is a good chance the therapy will improve recovery time, but there’s also the possibility it will make it worse. Average recovery times for knee surgery patients is 8.2 weeks. State null and alternative hypothesis for the same.
7. What is P – value? What is its significance?

**PART B**

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

1. A) Define single parameter exponential family. Show that Normal (µ0, σ2) belongs to single parameter exponential family (4)

B) Distinguish between estimator and estimate with example (3)

1. A) State the Neymann Factorization Theorem. (2)

B) Let x1, x2…xn be a random sample from a distribution with probability density function $f\left(x,θ\right)= \left\{\begin{array}{c}θx^{θ-1} 0<x<1, θ>0\\0 Otherwise\end{array}\right.$ Use the factorization theorem to obtain a sufficient statistic for θ (5)

1. A) Let x1, x2…xn be a random sample from U (0, θ). Obtain the maximum likelihood estimator for θ (3)

B) Define Consistency. Show that $\overbar{X}$ is a consistent estimator for population mean when the observations from Geometric(p) distribution (4)

1. A) Derive the 100(1 – α) % confidence interval for population variance (5)

B) Give the 100(1 – α) % confidence interval for correlation coefficient and explain the notations used (2)

1. A) Write a short note on: (i) Confidence coefficient (ii) Pivotal method of finding confidence interval (4)

B) An observed random sample of size 9 from a N (µ, 4) has a mean 50. Obtain 95% confidence interval for µ. (Take critical value as 1.96) (3)

1. Distinguish between (7)
	1. Simple hypothesis and Composite hypothesis
	2. Type I Error and Type II Error
	3. Acceptance Region and Rejection Region
2. Let X1, X2, …, Xn be a random sample from N (µ, σ02). Construct a most powerful test at level α, for testing H0: µ=µ0 against H1: µ = µ1(< µ0) (7)

**PART C**

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

1. Let X1, X2, …, Xn be a random sample from N (µ, σ2). Obtain the estimators for parameters using maximum likelihood estimator. Check whether estimators obtained above are unbiased estimators if not suggest an unbiased estimator. (10)
2. A) Suppose X1, X2, …, Xn be a random sample from Bernoulli distribution with parameter p. Examine whether there exists a minimum variance unbiased estimator for p. (5)

B) What is mean square error? Derive the expression for the same. (5)

1. A) Define most powerful test. (2)

B) Let X1, X2, …, Xn be a random sample from B (10, p). Construct a most powerful test at level α, for testing H0: p=p0 against H1: p =p1 (< p0) (8)