B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2024
SEMESTER 4 - MATHEMATICS / COMPUTER APPLICATIONS
COURSE : **19U4CPSTA04 / 19U4CRSTA04 - STATISTICAL INFERENCE**

(For Regular - 2022 Admission and Improvement / Supplementary - 2021/2020/2019 Admissions)

Time : Three Hours   Max. Marks: 75

(Use of Scientific calculator and statistical tables are permitted)
PART A
(Each Question carries **1** mark. Maximum marks from this part is **10**)

1. State Cramer-Rao inequality.
2. A random sample of size 16 from a normal distribution $N(\mu, 25)$ yielded $\overline{x}$ = 73.8. Find the 95% confidence interval for μ ?
3. Define (i) significance level and (ii) power of a test.
4. What do you mean by non parametric tests?
5. Distinguish between statistic and parameter.
6. Define critical region.
7. What are the properties of a good estimater?
8. Give an example of estimator which is not unbiased but consistent.
9. if S^2 is the variance of a random sample of size 'n' from a normal population with variance θ^2 then what is the unbiased estimate of θ^2 ?
10. Which method of estimation is based on Cramer- Rao inequality.
11. Which hypothesis decides whether a test is one tailed or two tailed?
12. In order to apply t-test the parent population should be --------

PART B
(Each question carries **3** marks. Maximum marks from this part is **15**)

13. Show that sample variance is a consistent estimator for the population variance when samples are taken from a normal population.
14. Explain how you will obtain a one-way classified data.
15. The standard deviations of two samples of sizes 10 and 14 from two normal populations are 3.5 and 3.0 respectively. Examine whether the standard deviations of the populations are likely to be equal.
16. Distinguish between Type I error and Type II error.
17. If 13.3,14.7,10.2,8.3,11.7,17.6,10.8 and 18.8 is a sample from the population which follows U(a,b) write down an estimate for each of the parameters a and b.
18. A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Find 99% confidence interval for the Proportion of bad pineapples.
19. Show that in estimating the mean of a normal population,sample mean is more efficient than the sample median.

PART C
(Each question carries **5** marks. Maximum marks from this part is **20**)

20. State Fisher-Neyman Factorisation theorem. Show that sample mean is a sufficient estimator of the mean of a normal population with unit variance?

21. For a Poisson distribution with parameter λ, show that $\frac{n\bar{x}}{n+1}$ is a consistent estimator for λ

22. Describe the method of maximum likelihood estimation of parameters. State the important properties of method of maximum likelihood estimator.

23. Obtain the chi-square test statistics for a 2 x 2 contingency table for testing the independence of two characteristics.

24. Explain the method of paired t test.

25. Obtain the maximum likelihood estimater of the mean and variance of a normal population.

PART D
(Each question carries **10** marks. Maximum marks from this part is **30**)

26. (i) Derive an expression of Chi-square statistic for testing independence in 2 x 2 contingency table
    (ii) Examine whether there is influence of sex in the consumption of coffee

	Male	Female
Like coffee	42	33
Don't like coffee	18	17

27. Distinguish between point estimation and interval estimation. A random sample of 16 observations taken form a normal population with mean μ and variance 6.25 is 23.6,28.1,27.2,21.0,27.8,25.1,22.5,18.4,31.1,30.0,26.3,20.6, 24.4,25.0, 19.6, and 22.2. Determine (i) a point estimate of μ (ii) a 99% confidence interval for μ

28. For the following data test whether the two population variances are equal:
    Sample A : 28 25 30 32 36 39 40 29 29 34
    Sample B : 16 33 34 40 41 28 25 26

29. 1000 students at college level are graded according to their I.Q. and their economic conditions.Test whether there is any association between economic conditions and the level of I.Q.

		IQ Level		
		poor	average	good
	Poor	150	100	50
Income Level	Average	200	150	150
	good	50	100	50