Reg. No .... Name **22U439**

B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2022

SEMESTER 4 : MATHEMATICS / COMPUTER APPLICATIONS

COURSE : **19U4CPSTA04 / 19U4CRSTA04 : STATISTICAL INFERENCE**

(For Regular - 2020 Admission and Supplementary - 2019 Admission)

Time : Three Hours Max. Marks: 75

PART A
Maximum marks for this section is 10

1. Define consistency?
2. An unbiased estimator of the population variance σ^2 is ------------------
3. Give an example of an estimator which is unbiased but not consistent
4. The sum and sum squares of a random sample of 11 observations from a normal distribution are 22 and 88 respectively. Find an unbiased estimate of the population variance.
5. State Cramer-Rao inequality
6. Write the formula for finding the confidence interval for mean when sample size is large.
7. Write the 95% confidence interval for the population proportion based on a large sample proportion p
8. Define power of a test?
9. Which hypothesis decides whether a test is one tailed or two tailed?
10. The p - value of a pared t test is 0.005. What decision we take at 1% level of significance?
11. Significance level of a test lies between ----------------- and ---------------
12. Give the model used in one-way classification analysis?

PART B
Maximum marks for this section is 15

13. How we can examine that an estimator is a good estimator for the parameter?
14. T is an unbiased estimator of θ. Is T^2 is unbiased for θ^2
15. Explain the method of minimum variance estimation
16. Obtain the maximum likelihood estimator for the parameter 'p' of a binomial distribution
17. Sample of sizes 10 and 14 were taken from two normal populations with standard deviation 3.5, and 5.2 and the sample means were found to be 20.3 and 18.6.. Test whether the means of two populations are the same at 5% level.
18. Distinguish between Large sample and small sample tests of significance
19. Distinguish parametric and non parametric tests?

PART C
Maximum marks for this section is 20

20. Explain the concept of sufficiency and efficiency. Obtain the sufficient estimator for the parameter λin a Poisson distribution
21. For a Poisson distribution with parameterλ, show that $\frac{n\,\overline{x}}{n+1}$ is a consistent estimator for λ

22. Find the m.l.e. of θ in the distribution f(x,θ) = θx^{θ} $0 < x < \theta,\ \theta > 0$

23. What do yu mean by a confidence interval? Derive a confidence interval for the difference of the means of two normal populations with known standard deviations

24. Explain the method of paired t test

25. A certain drug is claimed to be effective in curing cold. In an experiment on 165 people with cold, half of them were given the drug and othe other half was given sugar pills. The patient reaction to the treatment are presented in the following table. On the basis of this data can it be concluded that there is a significant difference in the effect of the drug and sugar pills.

	Helped	Harmed	No effect
Drugs	52	10	20
Sugar pills	44	12	2

PART D

Maximum marks for this section is 30

26. (i) Give an example of an estimate which is consistent but biased (ii) Derive the 95% confidene limit for the proportion of binomial population

27. (i) Describe how you would test the hypothesis of equality of two normal population means using student's t-statistic. (ii) Seven plants of wheat grown in plots and given a standard fertilizer treatment. Respective yields are 8.4, 4.5, 3.8, 6.1, 4.7, 11.2, 9.6 gram dry weight of seed. A further eight plants from the same source are grown in similar conditions byte with a different fertilizer and respective yields are 11.6, 7.5, 10.4, 8.4, 13.0, 7.0, 9.6, 13.2 gram dry weight of seed. Test whether the two fertilizer treatments have different effects on seed production at the 5% level.

28. (i) Briefly explain the concept of ANOVA (ii) A manufacturing company has purchased three new machines of different makes and wishes to determine whether one of them is faster than the others in producing a certain output. Five hourly production figures are observed at random from each machine and the results are as follows. Determine whether the machines are significantly different in their mean speeds.

Machine A	Machine B	Machine C
25	31	24
30	39	30
36	38	28
38	42	25
31	35	28

29. Fit a binomial distribution and test the goodness of fit.

X :	0	1	2	3	4	5	6
f :	105	80	43	30	26	9	7