

21U445

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Name: .....

Reg.No: .....

**FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023**

(CBCSS - UG)

(Regular/Supplementary/Improvement)

**CC19U STA4 C04 - STATISTICAL INFERENCE AND QUALITY CONTROL**

(Statistics - Complementary Course)

(2019 Admission onwards)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

**Part A (Short answer questions)**

Answer *all* questions. Each question carries 2 marks.

1. Distinguish between an estimate and estimator.
2. Define unbiasedness of estimators.
3. Define consistency.
4.  $V(t_1) = 15$  and  $V(t_2) = 8$ . Compute the relative efficiency of  $t_1$  with respect to  $t_2$ .
5. Briefly explain method of moment estimation.
6. Define type II error.
7. Define Neymann Pearson lemma.
8. State the test statistics used for testing equality of proportion of one population.
9. Write any application of F-test.
10. Which test is applied in ANOVA technique?
11. Explain non-parametric test?
12. What are assignable causes?

**(Ceiling: 20 Marks)**

**Part B (Short essay questions - Paragraph)**

Answer *all* questions. Each question carries 5 marks.

13. Show that sample mean is a sufficient estimator of  $\theta$  where  $\theta$  is the parameter of a population with density  $f(x, \theta) = \theta e^{-\theta x}$ ,  $x > 0$ .
14. Construct a  $100(1 - \alpha)\%$  confidence interval for the mean of a normal population with known standard deviation.
15. Explain the method of constructing 95% confidence interval for the proportion 'p' of possessing a characteristic in a population.

16. Nine observations taken from a normal population are 82, 84, 100, 98, 92, 101, 97, 79, 69. Based on this can we conclude that the population mean is greater than 94?
17. Explain goodness of fit.
18. Explain median test.
19. The following is the number of defective items observed in 15 consecutive sample of size 50 each :  
12, 9, 15, 14, 10, 8, 6, 12, 9, 5, 12, 10, 11, 9, 10.  
Draw the control chart for fraction defective and comment upon the state of control of the manufacturing process.

**(Ceiling: 30 Marks)**

**Part C (Essay questions)**

Answer any *one* question. The question carries 10 marks.

20. (i) What is a maximum likelihood estimator? What are the properties of MLE?  
(ii) Find the maximum likelihood estimator for the parameter  $\theta$  in the frequency function  
 $f(x, \theta) = \theta e^{-\theta x}, x \geq 0, \theta > 0.$
21. The following table gives the monthly sales (in thousand rupees) of a certain firm in three different states by four different salesmen.

States/Salesmen	W	X	Y	Z
A	10	8	8	14
B	14	16	10	8
C	18	12	12	14

State whether the difference between sales affected by the four salesmen and difference between sales affected in three States are significant?

**(1 × 10 = 10 Marks)**

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