



K23U 1147

Reg. No. : .....

Name : .....

IV Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/  
Improvement) Examination, April 2023  
(2019 Admission Onwards)

COMPLEMENTARY ELECTIVE COURSE IN STATISTICS  
4C04STA : Statistical Inference

Time : 3 Hours

Max. Marks : 40

**Instruction :** Use of calculators and statistical tables are permitted.

PART – A (Short answer)

Answer all 6 questions.

(6×1=6)

1. Define convergence in distribution.
2. State Cramer-Rao inequality.
3. Define estimator.
4. What do you mean by interval estimation ?
5. Write any two properties of maximum likelihood estimate.
6. State Naymann - Pearson Lemma.

PART – B (Short essay)

Answer any 6 questions.

(6×2=12)

7. Find the least value of probability  $P\{1 \leq x \leq 7\}$  when  $x$  is a random variable, with  $E(X)=4$  and  $V(X)=4$ .
8. Explain the weak law of large numbers.
9. Explain consistency with an example.
10.  $X_1, X_2, \dots, X_n$  is a random sample from a population with mean  $\theta$  and variance one. Show that both  $X_1$  and  $\bar{X}$  are unbiased for  $\theta$ . Compare their efficiencies.

P.T.O.



11. Find the maximum likelihood estimate for the probability density function  $f(x, \theta) = \theta e^{-x\theta} X > 0, \theta > 0$ .
12. Derive 95% confidence interval for the mean of normal population  $N(\mu, \sigma)$  when  $\sigma$  is unknown.
13. What do you mean by statistical hypothesis? Also explain simple and composite hypothesis.
14. Define analysis of variance. What are the assumptions of one-way analysis of variance?


  
**PART – C (Essay)**

Answer **any 4** questions.

**(4×3=12)**

15. State and prove Chebyshev's inequality.
16. Show that sample mean is sufficient for population mean when  $x$  follows Poisson distribution with parameter  $m$ .
17. Estimate  $\theta$  in the density function  $f(x, \theta) = (1 + \theta)x^\theta, 0 < x < 1$  by the method of moments.
18. A medical study showed 57 of 300 persons failed to recover from a particular disease. Find 95% confidence interval for the mortality rate of the disease.
19. Explain paired t-test.
20. Explain chi square test of independence.

**PART – D (Long Essay)**

Answer **any 2** questions.

**(2×5=10)**

21. Find probability of type one error and power of the test which rejects  $H_0$  : if  $x > 1 - \alpha$  in favour of  $H_1$  if  $X$  has pdf  $f(x) = \theta x^{\theta-1}, 0 < x < 1$  with  $H_0 : \theta = 1$  and  $H_1 : \theta = 2$ .



22. The following are samples from two independent normal populations. Test the hypothesis that they have the same mean assuming that the variances are equal by taking 5% level of significance.

**Sample 1:** 14 18 12 9 16 24 20 21 19 17  
**Sample 2:** 20 24 18 16 26 25 18

23. The theory predicts the proportion of beans in the four groups A, B, C, D should be 9 : 3 : 3 : 1. In an experiment among 1600 beans the numbers in the four groups were 882, 313, 287, 118. Does the experimental result support the theory ?

24. From different drugs have been developed in a certain disease. These drugs are used in 3 different hospitals and the result given below, show the number of cases of recovery from the disease per 100 people who have taken the drugs.

	A1	A2	A3	A4
B1	19	8	23	8
B2	10	9	12	6
B3	11	13	13	10

