K22U 1582

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree CBCSS (OBE) Regular/Supplementary/ Improvement Examination, April 2022
(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. What do you mean weak law of large numbers ?

2. Define sufficient estimator.

3. Give an example to show that unbiased estimator is not unique.

4. What is null hypothesis and alternative hypothesis ?

5. Write down the test statistic for testing the equality of two proportions.

6. Write down the assumptions of F-test for equality of variances.

PART – B

(Short Essay)

Answer **any 6** questions. **(6×2=12)**

7. If X follows binomial distribution with parameter n = 600 and $p = \frac{1}{6}$. Find the lower bound of $P(80 \leq X \leq 120)$.

8. If $(X_n, n \geq 1)$ be a sequence of random variables with mean μ_n and variance σ_n^2, which exist for all n and if $\sigma_n^2 \to 0$ as $n \to \infty$,then show that $X_n - \mu_n \xrightarrow{P} 0$.

9. State the central limit theorem for iid random variables.

P.T.O.

10. State Cramer-Rao inequality. State the necessary and sufficient condition for the inequality sign to be replaced by the equal sign.

11. If X follows a Poisson distribution with parameter θ and if $aX^2 + bX + c$ is an unbiased estimator of $(\theta + 1)(\theta + 2)$, then find the values of a, b and c.

12. Define (a) critical region (b) level of significance.

13. Distinguish between simple hypothesis and composite hypothesis. Give examples.

14. Briefly explain paired t-test.

PART – C

(Essay)

Answer **any 4** questions. **(4×3=12)**

15. State and prove Chebychev's inequality.

16. Let $X_1, X_2, \ldots, X_n$ be a random sample from uniform distribution over the interval [a, b]. Find the estimators of a and b by the method of moments.

17. Let $X_1, X_2, \ldots, X_n$ be a random sample from the normal population $N(0, \sigma^2)$. Show that $\sum_{i=1}^{n} X_i^2$ is a sufficient estimator for σ^2.

18. Let $X_1, X_2, \ldots, X_{10}$ be random sample of size 10 drawn from a Bernoulli distribution with parameter p. To test $H_0 : p = ½$ against $H_1 : p = ¼$, H_0 is rejected if $\sum_{i=1}^{10} X_i \leq 3$. Find the power of the test.

19. An owner of a big firm agrees to purchase the product of a factory, if the purchased item do not have variance of more than 0.5 mm in their length. The buyer selects a sample of 18 items from his lot and found that the standard deviation of the sample is 0.169. Perform an appropriate statistical test to make sure of the specification of the product, assuming the length of the product has a normal distribution.

20. Explain Chi-square test of goodness of fit.

PART – D
(Long Essay)

Answer **any 2** questions. **(2×5=10)**

21. a) Explain confidence estimation.

    b) In a random sample of 400 adults and 600 teenagers who watched a certain television program 100 adults and 300 teenagers indicated that they liked it. Construct a 95% confidence interval for the difference in proportions of all adults and all teenagers who watched the program and liked it.

22. State Neyman-Pearson Lemma. Use the Neyman-Pearson lemma to obtain most power full test for testing $H_0 : \mu = \mu_0$ against $H_0 : \mu = \mu_1, \mu_1 > \mu_0$, in the case of N (μ, σ^2), where σ^2 is known, based on a random sample of size n.

23. A sample analysis of examination results of 200 graduate students in the subject of mathematics, it was found that 46 had failed, 68 students secured third division, 62 secured a second division and the rest were placed in the first division. Test whether these figures are in agreement with the assumption that the result of all graduate students in mathematics are in the ratio 4 : 3 : 2 : 1 for various categories respectively.

24. A car rental agency, which uses 5 different brands of tyres in the process of deciding the brand of tyre to purchase as standard equipment for its fleet, finds that each of 5 tyres of each brand last the following number of kilometres (in thousands). Test whether the five tyre brands have almost same average life.

A	36	37	42	38	47
B	46	39	35	37	43
C	35	42	37	43	38
D	45	36	39	35	32
E	41	39	37	35	38