K21U 0901

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CBCSS – Sup./Imp.) Examination, April 2021
(2014 - '18 Admissions)
COMPLEMENTARY COURSE IN STATISTICS
4C04STA – Statistical Inference

Time : 3 Hours Max. Marks : 40

(**Use** of calculators and Statistical tables are **permitted**.)

PART – A : **Short Answer**

Answer **all** the **6** questions.

1. Distinguish between null and alternative hypothesis.
2. What is meant by confidence interval ?
3. What is a statistical hypothesis ? Give an example.
4. Mention the test and test statistic employed for testing whether population mean has a specified value in case of large samples.
5. Define unbiased estimator.
6. How sufficiency is related to conditional distribution ? **(6×1=6)**

PART – B : **Short Essay**

Answer **any 6** questions.

7. Obtain the confidence interval for the mean of a normal population when variance is known.
8. Explain the method of moment estimation.

P.T.O.

9. The lengths in inches of 5 screws made by a machine are 2.0, 2.1, 1.9, 2.2 and 2.3. Examine whether the average length of screws produced by this machine is 2 at 5% level of significance.

10. Show that sample mean is the sufficient estimator for the Poisson parameter.

11. A manufacturing process is expected to produce goods with a specified weight with variance less than 5 units. A random sample of 10 was found to have variance 6.2 units. Is there reason to suspect that the process variance has increased (use $\alpha = 0.05$) ?

12. Let $\overline{X}$ be the mean of n random samples taken from N (μ, σ) and s^2 be the sample variance. Show that $\frac{(\bar{x}-\mu)\sqrt{n-1}}{s} \to t_{(n-1)df}$.

13. For the random sample $X_1, X_2, \ldots, X_n$ taken from Poisson population with parameter λ. Show that $\frac{n\bar{x}}{n+1}$ is a biased estimator of λ.

14. Derive the m.g.f. of χ^2 distribution. **(6×2=12)**

PART – C : **Essay**

Answer **any 4** questions.

15. Describe the paired sample t test.

16. Mention the important properties of maximum likelihood estimators.

17. To test $H_0 : \theta = 1$ against $H_1 : \theta = 2$, a random sample of size one is taken from an exponential distribution with parameter θ. Compute probabilities of two types of error and power of the test for the critical region, $X \geq 1$.

18. Show that the sample mean $\overline{X}$ is a consistent for the population mean in random sampling from N (μ, σ).

19. State the interrelation among normal, Chi- square, t and F distributions.

20. If X_1 and X_2 are two independent standard normal variates. Prove that $t = \frac{\sqrt{2}\,X_1}{\sqrt{X_1^2 + X_2^2}}$ follows t distribution with 2 degrees of freedom. **(4×3=12)**

PART – D : **Long Essay**

Answer **any 2** questions.

21. a) Distinguish between point estimation and interval estimation with examples.

    b) Obtain the 95% confidence interval for $\mu_1 - \mu_2$ if samples are taken from two normal populations with $\overline{x}_1 = 20$, $\overline{x}_2 = 16$, $\sigma_1^2 = 9$, $\sigma_2^2 = 16$, $n_1 = 30$ and $n_2 = 50$.

22. a) Explain the test procedure for testing equality of population proportions based on large samples.

    b) What are the uses of t distribution ?

23. a) Explain the chi-square test for independence of attributes.

    b) The observed frequencies of cells such as (1,1), (1,2), (1,3), (2,1), (2,2), and (2,3) are respectively 40, 35, 55, 30, 65 and 75. Obtain the value of χ^2 statistic.

24. a) Derive the sampling distribution of mean of samples taken from a normal population $N(\mu, \sigma)$.

    b) A random sample of size 25 is taken from a normal population with mean 1 and variance 9. What is the probability that the sample mean is negative ?

(2×5=10)
