K20U 0901

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CBCSS-Reg./Sup./Imp.) Examination, April 2020
(2014 Admn. Onwards)
COMPLEMENTARY 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** the **6** questions.

1. Distinguish between estimate and estimator.
2. Define simple hypothesis.
3. What are the uses of t distribution ?
4. Show that p.d.f. of exponential distribution with parameter ½ and chi square distribution with 2 degrees of freedom are same.
5. How will you decide the best critical regions of a Z test ?
6. Give an instance where test for proportion is suitable. **(6×1=6)**

PART – B

(Short Essay)

Answer **any 6** questions.

7. 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 $\alpha = 0.05$).
8. Let $X_1, X_2, ..., X_n$ be a random sample from Bernoulli distribution with parameter p. Obtain a sufficient statistic for p.

P.T.O.

9. Obtain the 95% confidence interval for the mean of a Normal distribution $N(\mu, \sigma)$ when σ is known.

10. Derive the m.g.f. of chi square distribution.

11. Mention the important properties of maximum likelihood estimators.

12. Give a rough sketch of χ^2 distribution for n = 1, 2.

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. Establish the relation between normal, chi square, t and F distributions. **(6×2=12)**

PART – C

(Essay)

Answer **any 4** questions.

15. Define Student's t distribution. If X_1 and X_2 are two independent standard normal variables. Prove that $t = \frac{\sqrt{2}X_1}{\sqrt{X_1^2 + X_2^2}}$ follows t distribution with 2 d.f.

16. If T is an unbiased estimate of μ, check whether T^2 is unbiased for μ^2.

17. Describe the paired sample t test.

18. If $X_1, X_2, \ldots, X_n$ is a random sample from a normal population with mean μ and variance σ^2. Obtain the distribution of sample variance.

19. A manufacturing company making automobile tyre claims that the average life of its product is 35000 miles. A random sample of 16 tyres was selected and it was found that the mean life was 34000 miles with a S.D. 2000 miles. Test the hypothesis $H_0 : \mu = 35000$ against the alternative $H_1 : \mu < 35000$ at $\alpha = 5\%$.

20. Let X has p.d.f. $f(x) = (1 + \theta)x^{\theta}$, $0 \le x \le 1$. Find the power of the test which rejects $H_0 : \theta = \frac{1}{2}$ in favour of $H_1 : \theta = \frac{3}{4}$ if $x > \frac{1}{2}$. **(4×3=12)**

PART – D
(Long Essay)

Answer **any 2** questions.

21. a) Explain the chi-square test for independence of attribute.

    b) A thousand individuals from a district were classified according to sex and colour blindness to form the following :

	Male	Female	Total
Normal	442	514	956
Colour-blind	38	6	44
Total	**480**	**520**	**1000**

    Test the hypothesis that colour-blindness is independent of sex (use $\alpha = 0.05$).

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

    b) Estimate a 95% confidence interval for μ based on 10 random samples 22, 25, 30, 21, 24, 26, 24, 28, 25, 26 taken from $N(\mu, 5)$.

23. Let $X_1, X_2, ..., X_n$ is a random sample from a normal population with mean μ and variance σ^2. Obtain the moment estimators of μ and σ^2.

24. a) Define unbiasdeness and consistency of an estimate.

    b) Give an example of an estimate which is consistent but not unbiased.

(2×5=10)