K18U 0947

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CBCSS-Reg./Sup./Imp.) Examination, May 2018
COMPLEMENTARY COURSE IN STATISTICS FOR MATHEMATICS/ COMPUTER SCIENCE CORE
4C04STA : Statistical Inference
(2014 Admn. Onwards)

Time : 3 Hours | Max. Marks : 40

PART – A

(Short Answer)

Answer **all** the **6** questions. **(6×1=6)**

1. Define Student's distribution.
2. What do you mean by point estimation ?
3. State the Fischer Neymann factorisation criterion for sufficiency.
4. Define null and alternative hypothesis. Give one example for each.
5. Define power of a test.
6. Write down the test statistic for testing independence of attributes clearly mentioning each term.

PART – B

(Short Essay)

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

7. State and prove the reproductive property of Chi-square distribution.
8. Explain the interrelationship between t, F and Chi-square statistics.
9. If $X_1, X_2, \ldots, X_n$ are independent and identically distributed with mean μ and finite variance σ^2, then show that $\bar{X}$ is a consistent estimator of μ.

10. Check the validity of the statement : If T is an unbiased estimator of θ, then T^2 is an unbiased estimator of θ^2.

11. Let (20, 22, 21, 24, 21) be a random sample drawn N (μ, σ^2). Obtain a 95% confidence interval for σ^2.

12. Distinguish between simple and composite hypothesis with illustrative examples.

13. Describe the procedure of testing single population proportion.

14. The growth of tumours in nine rats provided the data with $\bar{x} = 4.3$, s = 1.2. Test for $H_0 : \mu = 4$ against $H_1 : \mu \neq 4$ at $\alpha = 0.10$, assuming normal distribution for these growths.

PART – C

(Essay)

Answer **any 4** questions. **(4x3=12)**

15. Derive the mean and variance of F distribution.

16. If $X_1, X_2, ..., X_n$ are a random sample of size n from the distribution with probability density function (p.d.f.) $f(x, \theta) = \theta x^{\theta-1}, 0 < x < 1, \theta > 0$, find the moment estimator of θ.

17. Derive the 95% confidence interval for σ^2, when a random sample of size n is taken from N (μ, σ^2), where μ and σ^2 unknown.

18. If $x \geq 1$, is the critical region for testing $H_0 : \theta = 2$ against $H_1 : \theta = 1$ on the basis of a single observation from $f(x, \theta) = \theta e^{-\theta x}, 0 < x < \infty, \theta > 0$, obtain the values of probability of Type I and Type II errors.

19. Describe the method of testing independence of attributes in a 2×2 contingency table.

20. What are the differences between usual t test and paired test ? Explain.

PART – D

(Long Essay)

Answer **any 2** questions. **(2x5=10)**

21. Derive the sampling distribution of Chi-square statistic.

22. Find the maximum likelihood estimators of θ when X is a random variable with p.d.f.

i) $f(x, \theta) = 1, \theta - \frac{1}{2} < x < \theta + \frac{1}{2}$ ii) $f(x, \theta) = \theta(1-\theta)^x, x = 0, 1, 2, ...$

23. The following are the numbers of a particular organism found in 100 samples of water from a pond. Test the hypothesis that these data are taken from a Poisson distribution.

No. of organisms	**Frequency**
0	15
1	30
2	25
3	20
4	5
5	4
6	1
7	0

24. Discuss the association between general abilities and mathematical abilities of school boys based on the following data :

Mathematical ability	**General Ability**			**Total**
	Good	Fair	Poor	
Good	44	22	4	**70**
Fair	265	257	178	**700**
Poor	41	91	98	**230**
Total	**350**	**370**	**280**	**1000**