K19U 0598

Reg. No.: ................................

Name: ....................................

# IV Semester B.Sc. Degree (CBCSS – Reg./Supp./Imp.) Examination, April 2019
## (2014 Admission Onwards)
## Complementary Course in Statistics for Mathematics/ Computer Science
## 4C04STA – STATISTICAL INFERENCE

Time : 3 Hours Max. Marks : 40

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

### PART – A
### (Short Answers)

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

1. Define sampling distribution.
2. What is the mean and variance Chi-square distribution with 2 degrees of freedom ?
3. Define efficiency of an estimator.
4. Define :
   a) Parameter b) Statistic.
5. What is composite hypothesis ? Give an example.
6. State Neymann Pearson Lemma.

### PART – B
### (Short Essay)

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

7. Define F distribution. Give the inter relationship between t, Chi-square and F distribution.
8. Write the moment generating function of Chi-square distribution and state the reproductive property of Chi-square distribution.

**P.T.O.**

Define unbiasedness. A random sample ($X_1$, $X_2$, $X_3$) is drawn from N ( $\mu$ , $\sigma$ ).

Obtain the value of $\lambda$ if $t = \frac{2X_1 + X_2 + \lambda X_3}{3}$ is unbiased for $\mu$ .

Obtain the maximum likelihood estimator of $\theta$ in the population given

$f(x) = (1+\theta)x^{\theta} \quad 0 \le x \le 1, \theta > 0$ .

Derive interval estimate of the difference of two population means, when $\sigma_1$, $\sigma_2$ unknown.

Explain Type I error and Type II error.

What is paired t-test ? What are the assumptions on t test ?

Distinguish between simple and composite hypothesis. Give one example each.

PART – C

**(Essay)**

wer **any 4** questions. **(4×3=12)**

Define t-distribution and point out any two characteristics of t-distribution.

Let $X_1$, $X_2$, $X_3$, ......, $X_n$ are i.i.d. P ( $\lambda$ ) random variables. Derive a sufficient statistic for $\lambda$ .

Determine 100 (1 – $\alpha$)% confidence interval for $\mu_1 - \mu_2$ if samples are taken from two normal populations with :

$\overline{X}_1 = 20, \overline{X}_2 = 16, \sigma_1^2 = 9, \sigma_2^2 = 16, n_1 = 30, n_2 = 50$ .

A random sample of size 15 from a normal population gives sample mean is 3.2 and sample variance is 4.24. Determine the 95% confidence limits for $\sigma^2$.

Explain the procedure for testing equality of population proportions based on large samples.

Distinguish between large sample test and small sample test.

## PART – D
## (Long Essay)

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

21. Derive the sampling distribution of variance.

22. Derive confidence interval for population mean $\mu$ when (i) $\sigma_1$, $\sigma_2$ known (ii) $\sigma_1$, $\sigma_2$ unknown.

23. Two samples are drawn from two normal populations. Based on the data test whether the two populations have

    a) the same mean

    b) the same variance

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| **Sample I :** | 4.0 | 4.4 | 3.9 | 3.9 | 4.0 | 4.2 | 4.4 | 5.0 | 4.8 | 4.6 |
| **Sample II :** | 5.3 | 4.3 | 4.1 | 4.4 | 5.3 | 4.2 | 3.8 | 3.9 | 5.4 | 4.6 |

24. Discuss briefly the different applications of chi-square as a test statistic.