



K16U 0703

Reg. No. : .....

Name : .....

IV Semester B.Sc. Degree (CBCSS – 2014 Admn. Regular)  
Examination, May 2016  
COMPLEMENTARY COURSE IN STATISTICS FOR MATHEMATICS/  
COMPUTER SCIENCE CORE  
4C04STA : Statistical Inference

Time : 3 Hours

Max. Marks : 40

PART – A  
(Short answer)

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

1. Define standard error.
2. Write the probability density function (p.d.f.) of F distribution.
3. What are the desirable properties of a good estimator ?
4. Distinguish between simple and composite hypotheses.
5. Define power of a test.
6. What is a contingency table ?

PART – B  
(Short essay)

Answer **any 6** questions : (6×2=12)

7. Obtain the mean of a Chi-square random variable with n degrees of freedom.
8. Establish the interrelationship between t-statistic and chi-square statistic.
9. State Fisher Neymann factorisation criterion and find a sufficient statistic for the parameter  $\lambda$  of a Poisson distribution.

P.T.O.



10. Derive the maximum likelihood estimator of the parameter  $\theta$ , when a random sample of size  $n$  is taken from  $f(x, \theta) = \theta e^{-\theta x}$ ,  $0 < x < \infty$ ,  $\theta > 0$ .
11. Define the terms :
  - i) Type I error
  - ii) Type II error
  - iii) Critical region.
12. Obtain an unbiased estimator for  $e^{-\lambda}$  where  $\lambda$  is a parameter of a Poisson distribution.
13. Explain paired t-test.
14. Write the test statistics for testing mean of a Normal population based on a random sample of size  $n$ , under the cases the standard deviation is
  - i) Known and ii) Unknown.

## PART – C

## (Essay)

Answer **any 4** questions :

(4×3=12)

15. If  $F \sim F(m, n)$ , derive the distribution of  $\frac{1}{F}$ .
16. State and prove a sufficient condition for the consistency of an estimator.
17. Obtain 95 percent confidence limits for the population mean, when samples are taken from  $N(\mu, \sigma^2)$ , when  $\sigma$  known.
18. For testing  $H_0 : p = \frac{1}{4}$  against  $H_1 : p = \frac{3}{4}$ , a random sample of 4 observations are taken from Bernoulli (1,  $p$ ).  $H_0$  is rejected if we get 4 successes. Compute significance level.
19. Construct the test for equality of two population proportions.
20. Describe the method of testing independence of qualitative characteristics.



**PART – D**  
**(Long Essay)**

Answer **any 2** questions :

**(2×5=10)**

- 21. Derive the sampling distribution of the sample variance  $S^2$  when we take samples from a Normal distribution.
- 22. Explain the method of moments in estimation. Obtain the estimators of the parameters of Beta (m, n) distribution, using method of moments.
- 23. A random sample of size 7 brand X light bulbs yielded,  $\bar{X} = 891$  hours and  $s^2 = 9201$ . A random sample of size 10 brand Y light bulbs yielded  $\bar{Y} = 592$  hours and  $s^2 = 4856$ . Test for equality of population variances at 0.05 significance level, stating the necessary assumptions.
- 24. A hospital administrator wishes to test the null hypothesis that emergency admissions follow a Poisson distribution with  $\lambda = 3$ . Over a period of 90 days, the numbers of emergency admission were as follows :

No. of emergency admissions in a day	Number of days (frequency)
0	5
1	14
2	15
3	23
4	16
5	9
6	3
7	3
8	1
9	1
10 or more	0