M 3545

Reg. No. : ....

Name : ....

IV Semester B.A./B.Sc./B.Com./B.B.A./B.B.A.T.T.M./B.B.M./B.C.A./B.S.W/ B.A. Afsal-Ul-Ulama Degree (CCSS – Reg./Supple./Improv.) Examination, May 2013

COMPLEMENTARY COURSE IN STATISTICS FOR MATHS/ COMPUTER SCIENCE CORE

4C04 STA : Statistical Inference

Time: 3 Hours Max. Weightage : 30

***Instruction :** Use of scientific calculator permitted statistical tables are permitted.*

PART – A

Answer **any 10** questions. **(Weightage 1 each)**

1. Define standard errors.
2. A sample of size 16 is taken from a normal population with mean 50 and standard deviation 20. What is the probability that the sample mean is at least 60 ?
3. Find the mean of Chi-square distribution with n degrees of freedom.
4. Write down the density function of student's t-distribution with n degrees of freedom. Hence find its mean.
5. Define F-statistic. Write down its probability density function.
6. Define unbiased estimator.
7. State Neyman-Pearson theorem.
8. Define Type I and Type II errors.
9. Define minimum variance unbiased estimator.
10. Distinguish between parametric and non-parametric tests.
11. Write down the expression for x^2 for testing the independence of attributes in a 2×2 contingency table.

(10×1=10)

P.T.O.

PART – B

Answer **any 6** questions : **(Weightage 2 each)**

12. Derive the variance of t-distribution.

13. If F has F-distribution with (n_1, n_2) degrees of freedom, show that $\frac{1}{F}$ has F-distribution with (n_2, n_1) degrees of freedom.

14. If $x_1\ x_2 \ldots x_n$ is a sample of size n from a Bernoulli population with parameter p, find unbiased estimators of p and p^2.

15. If Tn is an estimator of a parameter θ such that $E\ Tn = \theta$ and $V(Tn) \to 0$ as $n \to \infty$, show that Tn is consistent for θ.

16. Obtain a 100 (1 – 2)% confidence interval for the mean of a normal population when the population variance is (1) unknown (2) known.

17. Let $x_1\ x_2 \ldots x_n$ be a sample of size n from a population with density function

$$f(x)=\begin{cases} 1/\theta & \text{if } 0<x<\theta \\ 0 & \text{otherwise} \end{cases}$$

Find the MLE of θ.

18. To test $H_0 : p = 1/2$ against $H_1 : p = 3/4$ where p is the probability of getting a head in a single toss of a coin, the coin is tossed 5 times. It is decided to reject H_0 if more than – 3 heads are obtained. Find the probability of Type I error and power of the test.

19. Obtain the most powerful size α test for $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 (\theta_1 > \theta_0)$ for the population density

$$f(x)=\begin{cases} \theta\, x^{\theta - 1} & \text{if } 0 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

based on a sample of size n.

20. Explain the procedure for testing the equality of two population proportions.

(6×2=12)

PART – C

Answer **any two** questions. **(Weightage 4 each)**

21. Let $x_1, x_2 \dots x_n$ be a sample of size n from a population with density function

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}\, x}\, e^{-\frac{1}{2}\left(\frac{\log x - \mu}{\sigma}\right)^2}; x > 0$$

Obtain the method of moments estimators of μ and σ^2.

22. Let (x_1, x_2) be a sample of size 2 selected from a population

$$f(x) = \begin{cases} \frac{1}{\theta} e^{-x/\theta}; & x > 0 \\ 0 & \text{otherwise} \end{cases}$$

To test $H_n : \theta = 2$ against $H_1 : \theta = 4$ it is decided to accept H_0 if $x_1 + x_2 \geq 9.5$ and to reject otherwise. Obtain the level of significance and power of the test.

23. The gain in weights of two random samples of 8 rats each fed on two different diets A and B are given below :

Diet A :	49	53	51	52	47	50	52	53
Diet B :	52	55	52	53	50	54	54	53

Examine whether the difference in the average gain in weights is significant (choose 5% level of significance).

24. Fit a Poisson distribution to the following data and list the goodness of fit

No. of mistakes in a page :	0	1	2	3	4	5	6
No. of pages :	275	72	30	7	5	2	1

(Choose 5% level of significance.) **(2×4=8)**