M 787

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, April 2012
COMPLEMENTARY COURSE IN STATISTICS FOR MATHS AND 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. Mention any two uses of standard error.
2. A sample of size 20 is taken from a normal population with mean 30 and variance 10. If S^2 is the variance of the sample, what is the probability distribution of 2 S^2 ?
3. Find the mean of chi-square distribution with n degrees of freedom.
4. Write down the density function of F-distribution with (n_1, n_2) degrees of freedom.
5. Find the variance of student's t-distribution.
6. Define consistent estimator.
7. Define sufficient statistic.
8. Define level of significance and power of test.
9. What is confidence interval for a parameter ?
10. Why non-parametric tests are called distribution free tests ?
11. What is a contingency table ? Write down the expression for the value of chi-square 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 moment generating function of chi-square distribution. Hence establish the additive property of chi-square distribution.

13. Discuss the inter-relationships among normal, chi-square, student's t and F-distributions.

14. Show that the sample variance is always a biased estimator of the population variance. Hence, find an unbiased estimator of the population variance.

15. Let $X_1, X_2, \ldots X_n$ be a sample of size n from a population density function

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

Find a sufficient statistic for θ.

16. Derive a 100 $(1 - \alpha)$ % confidence interval for the difference of the means of two normal populations, stating the assumptions, if any.

17. Obtain the MLE of the parameter θ of the population density function

$f(x) = \frac{1}{2} e^{-|x-\theta|}; -\infty < x < \infty$ based on a sample of size n .

18. To test $H_0 : \theta = 1$ against $H_1 : \theta = 2$, a sample of size one is taken from a

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

Find the level of significance and power of the test if H_0 is rejected when the sample observation is greater than 1.5.

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 $f(x) = \begin{cases} \theta e^{-\theta x}; & x > 0 \\ 0 & \text{otherwise} \end{cases}$ based on a sample of size n.

20. Explain the paired t-test.

(6×2=12)

PART – C

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

21. Obtain the method of moments estimators of a and b of the population density function $f(x) = \begin{cases} \frac{1}{b-a} & \text{if } a < x < b \\ 0 & \text{otherwise} \end{cases}$ based on a sample of size n.

22. To test $H_0 : \theta = 1$ against $H_1 : \theta = 2$ a random sample (X_1, X_2) of size 2 is selected from the population $f(x) = \begin{cases} \theta x^{\theta-1}; & 0 < x < 1 \\ 0 & \text{otherise} \end{cases}$. Find the level of significance and power of the test if the critical region is given by $X_1 X_2 \geq 3/4$.

23. A survey of 320 families with five children each gave the following distribution :

No. of boys :	0	1	2	3	4	5
No. of families :	12	40	88	110	56	14

Use chi-square test to test whether male and female births are equally probable (choose $\alpha = 0.05$).

24. The following data give the number of hours of service rendered by spark plugs manufactured by two sources.

Source A :	200	210	190	200	190	200	180	200	200	210
Source B :	190	200	210	190	180	190	200	192		

Test whether there is any significant difference in average length of service. (choose $\alpha = 0.05$). **(2×4=8)**