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Name.....74....

Reg. No.....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2015

(CUCBCSS—UG)

Complementary Course

STS 3C 03—STATISTICAL INFERENCE

Time : Three Hours

Maximum : 80 Marks

Section A

Answer **all** *questions each in* **one** *word.*
Each question carries 1 *mark.*

Name the following :

1 The function of random samples taken from a population.

2 The probability distribution of the sum of squares of '*n*' independent standard normal random variables.

3 The inequality which helps us to obtain an estimator with minimum variance.

Fill up the blanks :

4 A function of sample values representing the population parameter is the _____ of that parameter.

5 A Student's t random variable ranges in between _____.

6 Fisher-Neyman factorization theorem is used for finding _____ estimator.

7 The standard deviation of any statistic is called its _____.

Write true *or* false :

8 If T is a consistent estimator of θ, then T^2 is also consistent for θ^2.

9 MLE's are always unbiased.

10 In a testing procedure, type I error is more serious.

($10 \times 1 = 10$ marks)

Section B

Answer **all** *questions in* **one** *sentence each.*
Each question carries 2 *marks.*

11 Define statistical inference.

12 Define confidence coefficient.

13 Identify the distribution of the ratio of the squares of two independent standard normal random variables.

Turn over

14 A random sample of size 25 is taken from a normal population with mean 1 and variance 9. Find the probability to get a sample with a negative sample mean.

15 State the additive property of chi square distribution.

16 Define most powerful test.

17 State Neymaan-Pearson Lemma.

(7 × 2 = 14 marks)

Section C

Answer any **three** *questions.*
Each question carries 4 *marks.*

18 Obtain the m.g.f. of a chi square random variable with n degrees of freedom.

19 For a Poisson distribution with parameter X, show that sample mean is the sufficient estimator.

20 Explain the method of moment estimation.

21 Define type I and type II errors in testing of hypothesis.

22 What are the steps involved in testing of hypothesis ?

(3 x 4 = 12 marks)

Section D

Answer any **four** *questions.*
Each question carries 6 *marks.*

23 Prove that the square of a standard normal random variable follows chi square distribution with 1 d.f.

24 If X is distributed as $f(x)=\frac{1}{\theta}, 0<x<\theta$, show that $-2\log_e\left(\frac{x}{\theta}\right)$ follows chi-square distribution with 2 degrees of freedom.

25 State and prove the sufficient conditions for a consistent estimator.

26 Derive confidence interval for the mean of a normal population when (i) population standard deviation is known ; (ii) population standard deviation is unknown.

27 Let p be the probability that a coin will fall head in a single toss. In order to test $H_0 : p=\frac{1}{3}$ against $H_1 : p=\frac{3}{4}$. The coin is tossed 5 times and H_0 is rejected if more than 2 heads obtained. Find the size and power of the test.

28 Explain the method of chi square test of independence of attributes.

(4 × 6 = 24 marks)

Section E

Answer any **two** *questions.*
Each question carries 10 *marks.*

29 If $X \sim F(n_1, n_2)$, prove that $Y = \frac{1}{X}$ follows $F(n_2, n_1)$. Hence obtain the relation X between a and b, if $P(X < a) = P(Y > b)$.

30 If $x_1\ x_2, \ldots, x_n$ are the ransom samples taken from $N(\mu, \sigma)$, prove that sample variance is a biased estimator of population variance. Hence obtain an unbiased estimator for population variance.

31 (i) Explain the method of testing of population proportion, when large samples are taken.

(ii) A manufacturer claims that only 4% of his products are defective. Random samples of 500 were taken among which 100 were defective. Test the claim under 5% of level of significance.

32 (i) Explain the method of testing the equality of means of two normal populations when the population standard deviations are unknown and small numbers of samples are drawn.

(ii) Following are the set of observations from two normal populations. Test the equality of their means at 5% of significance level

From first population	:	11	11	13	11	15	9	12	14
From second population	:	9	11	10	13	9	8	10	

(2 × 10 = 20 marks)