C 31166

(Pages : 3)

Name.................................

Reg. No.................................

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2017

(CUCBCSS—UG)

Complementary Course

STS 3C 03—STATISTICAL INFERENCE

Time : Three Hours

Maximum : 80 Marks

Section A

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

Name the following :

1. The process of making inference about the population based on samples taken from it.
2. The probability of rejecting null hypothesis when it is false.
3. The distribution used in testing goodness of fit.

Fill up the blanks :

4. An efficient estimator is an estimator with minimum ————.
5. If X follow standard normal distribution, then $Y = X^2$ follows ————.
6. If X_1 and X_2 are two independent standard normal variables, then $t = \frac{\sqrt{2}\, X_1}{\sqrt{X_1^2 + X_2^2}}$ follows ————.
7. The standard deviation of any statistic is called its ————.

Write True *or* False :

8. If $t_n \xrightarrow{p} \theta$, then t_n is a sufficient estimator of θ.
9. Fisher-Neyman theorem helps to obtain sufficient estimator.
10. A statistical hypothesis which completely specifies the population is simple hypothesis.

(10 × 1 = 10 marks)

Turn over

Section B

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

11. Define point estimator.
12. Define confidence coefficient.
13. Identify the distribution of the ratio of two independent standard normal random variables.
14. Define critical region.
15. Define consistent estimator.
16. State Fisher-Neymaan factorization theorem.
17. What is meant by paired t-test ?

(7 × 2 = 14 marks)

Section C

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

18. Obtain the m.g.f. of a Chi-square random variable with n degrees of freedom.
19. Distinguish between one tailed and two tailed test.
20. Describe any two statistics following student's t-distribution.
21. Explain the method of maximum likelyhood estimation.
22. Explain the procedure of testing equality of variances.

(3 × 4 = 12 marks)

Section D

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

23. For a random variable of size 16 from $N(\mu, \sigma)$ popuiation, the sample variance is 16.

    Find a and b such that $P\left(a < \sigma^2 < b\right) = 0.60$.
24. Find the mode of a random variable follow t-distribution with n degrees of freedom.
25. Explain the method of moment estimation. List the properties of a moment estimator.
26. Derive the confidence interval for the variance of a normal population.
27. In a sample of 60 items, 8 are damaged. Construct a 95% confidence interval for the true proportion of damaged items.
28. Explain the method of Chi-square test of independence.

(4 × 6 = 24 marks)

Section E

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

29. (i) If t follows t-distribution with n degrees of freedom, prove that $Y = t^2$ follows $F(1, n)$.

    (ii) Derive a statistic following F-distribution.

30. Use Neyman-Pearson Theorem to find a most powerful test with significance level α for testing the hypothesis $H_0 : \mu = \mu_0$ against, $H_1 : \mu = \mu_1, (\mu_1 > \mu_0)$ using a random sample $x_1, x_2, \ldots, x_n$ drawn from the population with pdf $f(x) = \frac{1}{\sqrt{18\pi}} e^{-\frac{1}{18}(x-\mu)^2}, -\infty < x < \infty$.

31. Explain Chi-square test of goodness of fit. The theory predicts the proportion of beans in the four groups A, B, C and D should be 9 : 3 : 3 : 1. In an experiment among 1600 beans, the members in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory ?

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

    (ii) Gain in weights for two groups of rates fed on two types of diets are as follows :

Diet A	:	13	14	10	11	12	16	10	8	
Diet B	:	7	10	12	8	10	11	10	9	11

Test the effect of diet in gain in weights at 5% level of significance.

(2 × 10 = 20 marks)