D 71705-B (Pages : 3) **Name**.....

Reg. No.....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2019

(CUCBCSS—UG)

Statistics

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 sample values, which gives a good approximation for the required parameter.
2. A statistical hypothesis which completely specifies the population.
3. Any function of the statistical population (or population) values.

Fill up the blanks :

4. The distribution of statistic is known as the ———— of that statistic.
5. For the random sample of size 15 is taken from N (5, 2), $P(\bar{x} > 5)$ = ————.
6. In a statistical testing of hypothesis, the hypothesis is to be tested is termed as ————.
7. If X follow N (0,1), then X^2 follows Chi-square distribution with ———— d.f.

Write True *or* False :

8. If T is a consistent estimator of θ, then E (T) need not be θ.
9. Fisher-Neyman theorem helps to obtain sufficient estimator.
10. Size of test is 1 – P (Type II error).

(10 × 1 = 10 marks)

Section B

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

11. Define Statistic.
12. Define confidence coefficient.
13. Write any two statistics following *t* - distribution.
14. Define efficient estimator.

15. State Fisher-Neyman factorization theorem.

16. Define most powerful test

17. State Neyman-Pearson lemma.

(7 × 2 = 14 marks)

Section C

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

18. Obtain the mean of a random variable t distribution with n degrees of freedom.

19. What are the steps involved in testing of a hypothesis ?

20. Find the moment estimator of λ using n random samples $x_1, x_2, ..., x_n$ taken from a Poisson population with the parameter λ.

21. A sample of size 17 taken from $N(\mu, \sigma)$. Mean of the sample is 15 and the sample variance is 9. Using the data, find a 90% confidence interval for μ.

22. Define significance level and power of a test in testing of hypothesis.

(3 × 4 = 12 marks)

Section D

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

23. Find the m.g.f. of X following Chi-square distribution with n d.f., and hence state and prove the additive property of Chi-square distribution.

24. If X_1 and X_2 are two independent standard normal variables, obtain the distribution of

(i) $\dfrac{\sqrt{2}X_1}{\sqrt{X_1^2 + X_2^2}}$ (ii) $\dfrac{X_1}{X_2}$.

25. Define MLE. Obtain the MLE of the parameter θ, using random samples $x_1, x_2, ..., x_n$ taken from the population with p.d.f. $f(x,\theta) = \dfrac{1}{\sqrt{2\pi\theta}} e^{-\frac{x^2}{2\theta^2}}, -\infty < x < \infty.$

26. In a sample of 60 items, 8 are damaged. Construct a 95% confidence interval for the true proportion of damaged items.

27. In a coin tossing experiment, let p be the probability of getting a head. The coin is tossed 10 times to test the hypothesis $H_0 : p = 0.5$ against the alternative $H_1 : p = 0.7$ Reject H_0, if 6 or more tosses out of 10 result in head. Find significance level and power of the test.

28. Explain the Chi-square test of independence.

(4 × 6 = 24 marks)

Section E

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

29. Define F- distribution. If t follows student's t-distribution with n degrees of freedom, show that t^2 follows F distribution with $(1, n)$ degrees of freedom.

30. x_1, x_2 are two random sample taken trom a population with p.d.f. $f(x) = \frac{1}{\theta} e^{-\frac{x}{\theta}}, 0 < x < \infty ; \theta > 0$. To test $\theta = 2$ against $\theta = 4$, the critical region is $x_1, x_2 \geq 9.5$. Obtain the significance level and power of the test.

31. (i) Explain Chi-square test of goodness of fit.

    (ii) 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 numbers 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)