19U343S (Pages: 2) Name: …………………….

Reg. No……………………

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2020
(CUCBCSS-UG)

CC15U ST3 C03 - STATISTICAL INFERENCE
(Statistics - Complementary Course)

(2015 to 2018 Admissions – Supplementary/Improvement)

Time: Three Hours   Maximum: 80 Marks

Section A
Answer *all* questions. Each question carries 1 mark.

1. The mean of a random variable following *t* distribution is ----------
2. Mode of a Chi square random variable with 10 degrees of freedom is ----------
3. If $t \sim t_{(n)}$, the distribution of t^2 is ----------
4. If $F \sim F_{(m,n)}$, then the distribution of $\frac{1}{F}$ is --------
5. If s^2 is the variance of a sample of size n taken from $N(\mu, \sigma^2)$ then $E\left(\frac{ns^2}{\sigma^2}\right)$ is ---------
6. Maximum likelihood estimator of μ, where μ is the mean of a normally distributed population is --------
7. -------- is an example of biased but consistent estimator of variance of normally distributed population.
8. The test for depended sample is based upon -------- distribution.
9. The test used for goodness of fit is ----------
10. In a test for independence of characteristics with 3 x 4 contingency table the degree of freedom of Chi square is ----------

(10 x 1 = 10 Marks)

Section B
Answer *all* questions. Each question carries 2 marks.

11. Define standard error sampling distribution.
12. Give any two uses of Chi square distribution.
13. Define likelihood function.
14. Explain interval estimation.
15. Briefly explain method of moment estimation.
16. What are two types of errors in testing of hypothesis?
17. Distinguish in between simple and composite hypothesis

(7 x 2 = 14 Marks)

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

18. Derive the moment generating function of χ^2 distribution and hence obtain its mean.

19. Let $X_i \sim N(0, 1)$, $i = 1, 2, 3$. If X_i 's are independent find distribution of $\frac{X_1^2}{X_2^2 + X_3^2}$

20. Derive the confidence interval for proportion of a population.

21. If t is a consistent estimator θ, then show that t^2 is a consistent estimator of θ^2

22. Explain: i) Significance level   ii) Power of Test

(3 x 4 = 12 Marks)

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

23. Derive the interrelationship between t, χ^2 and F distribution.

24. If $Z \sim N(0, 1)$ then show that Z^2 follows Chi square distribution with one degree of freedom.

25. Let $X \sim$ Uniform $(0, \theta)$. Find the level of significance and power of the test which rejects the hypothesis $H_0: \theta = 1$ in favour of $H_1: \theta = 2$ whenever $X > 0.25$

26. Explain paired t test.

27. Find the maximum likelihood estimator of λ in Poisson (λ) distribution.

28. Suppose in a survey of 400 people from one city, 188 preferred brand A soap and in a sample of 500 people from another city, 210 preferred the same product. Test the hypothesis that $H_0: p_1 = p_2$ against $H_1: p_1 \neq p_2$ at 5% significance level where p_1 and p_2 are the proportions of preferring brand A soap in two cities.

(4 x 6 = 24 Marks)

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

29. (a) find the moment estimator and M.L.E. for the parameter θ if the distribution

$f(x, \theta) = (\theta + 1)x^\theta$, $o \leq x \leq 1$

   (b) If a random sample of size 8 from this population produces the data 0.2, 0.4, 0.8, 0.5, 0.7, 0.9, 0.8, 0.9. Find that the values of moment estimator and M.L.E. of θ.

30. Derive the sufficient estimators for the parameters of Normal distribution with mean μ and variance σ^2.

31. Derive the 95% confidence interval for the mean of normal population $N(\mu, \sigma^2)$.

32. The demands for refrigerators in a city are found to vary from day to day. In a sample study, the following data was obtained. Test at 5% level of significance whether the demand for refrigerator depends on the days of the week.

Days	Mon	Tue	Wed	Thu	Fri	Sat
No. of refrigerators in demand	115	126	120	110	125	12

(2 x 10 = 20 Marks)

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