20U343S (Pages: 2) Name: ………………………

Reg. No: ……………………

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2021

(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. Standard deviation of a sampling distribution is known as ....
2. Variance of chi-square random variable with 8 degrees of freedom is ....
3. If a random variable X follows F(n_1, n_2) degrees of freedom, then the distribution of $\frac{1}{X}$ is ....
4. .... is an example for consistent estimator, but not unbiased?
5. The test for goodness of fit is based upon .... distribution.
6. If Tn is a consistent estimator of θ, then as 'n' tends to infinity V (Tn) tends to ....
7. If $t \sim t_{(n)},$ the third central moment of t = ...
8. Critical region is the region of ....
9. Probability of type I error is called ....
10. The test statistic used for the test $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$ for large sample is ....

(10 × 1 = 10 Marks)

SECTION B.

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

11. Define sampling distribution.
12. Define consistency.
13. Define likelihood function.
14. Explain method of moments.
15. What are the properties of MLE?
16. Distinguish between simple and composite hypothesis.
17. What are the assumptions of t-test?

(7 × 2 = 14 Marks)

SECTION C

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

18. State and prove the reproductive property of Chi-square distribution.
19. Show that all odd central moments of t distribution is zero.
20. Show that sample mean is an unbiased estimate of the population mean.
21. If $X \geq 1$ is the critical region for testing $\theta = 2$ against the alternative $\theta = 1$ on the basis of a single observation from the population with p.d.f $f(x) = \theta e^{-\theta x}, 0 < x < \infty$. Obtain level of significance.

22. Explain the method of constructing 95% confidence interval for the population mean, when the samples are taken from a normal population with known standard deviation.

(3 × 4 = 12 Marks)

SECTION D.

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

23. Derive the mean of F distribution.
24. If X is uniformly distributed in the interval (0, 1), then show that $Y = -2log\frac{x}{\theta}$ is a chi-square variate with 2 d.f.
25. X_1, X_2, X_3 are three independent observations taken from a population with mean μ and variance σ^2. If $t_1 = X_1 + X_2 - X_3$ and $t_2 = 2X_1 + 3X_2 - 4X_3$. Compare the efficiencies of t_1 and t_2.
26. A test of 100 youths and 200 adults showed that 42 of the youths and 50 of the adults were poor drivers. Use the data to test the claim that youth percentage of poor drivers is larger than the adult percentage.
27. Explain paired *t* test.
28. Explain chi-square test for goodness of fit.

(4 × 6 = 24 Marks)

SECTION E

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

29. Let X follows standard normal distribution and Y follows chi-square distribution with n degrees of freedom, then derive the distribution of the statistic $t = \frac{X}{\sqrt{\frac{Y}{n}}}$.
30. Find the M.L.E of p for a binomial population with p.d.f $f(x) = (NC_x)p^x(1-p)^{N-x}$ where N is known.
31. 12 Rats were given a high protein diet and another set of 7 rats given a low protein diet. The gain in weight in grams observed in the two sets are given below.

High Protein Diet	:	13	14	10	11	12	16	10	08	11	12	09	12
Low Protein Diet	:	7	11	10	08	10	13	09					

Examine whether the high protein diet is superior to the low protein diet at 5% level of significance.

32. (i) Two random samples of size 8 and 11 drawn from two normal populations are characterized as follows.

Sample Size	Sum of observations	Sum of square of observations
8	9.6	61.52
11	16.5	73.26

Examine whether the two samples came from populations having the same variance.

(ii) Explain the Chi square test for independence of attributes.

(2 × 10 = 20 Marks)

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