22U476S (Pages: 3) Name: ……………….……..

Reg. No: …..……………….

FOURTH SEMESTER B.Voc. DEGREE EXAMINATION, APRIL 2024

(CBCSS-UG)

CC18U GEC4 ST11 – STATISTICAL INFERENCES AND APPLICATIONS

(Information Technology)

(2018 to 2020 Admissions - Supplementary)

Time: Three Hours Maximum: 80 Marks

PART A

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

1. Student's t curve is symmetric about ________
2. The ratio of two sample variances is distributed as ________ distribution.
3. The value of an estimator is called ________
4. An estimator with a smaller variance than that of another estimator is ________
5. Method of moments was introduced by ________
6. An ________ estimate of a population parameter provides two values between which it is estimated that the parameter lies.
7. The 95% confidence interval for the mean of a normal population $N(\mu, \sigma)$ is ________
8. Rejecting H_0 when H_0 is true ________
9. Neymann Pearson lemma provides a most powerful test. Write True or False
10. The expected frequency for any cell in a contingency table should not be less than 5. Write True or False.

(10 × 1 = 10 Marks)

PART B

Answer any ***eight*** questions. Each question carries 2 marks.

11. Define standard error.
12. What do you mean by the statistic?
13. What is the relation between mean and variance of chi-square distribution?
14. Define the unbiasedness of an estimator.
15. State the necessary and sufficient conditions for consistency of an estimator.
16. What are the properties of MLE?
17. What is a point estimate?
18. The mean of a sample of size 20 from a normal population $N(\mu, 8)$ was found to be 81.2. Find a 95% confidence interval for μ.

19. Distinguish between null and alternative hypotheses.
20. Define the level of significance.
21. State Nyman Pearson lemma.
22. What are the assumptions on the two sample t-test?

(8 × 2 = 16 Marks)

PART C

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

23. Derive the sampling distribution of the mean of samples from a normal population.
24. Define the chi-square distribution with n degrees of freedom and derive its MGF
25. Show that the sample mean is an unbiased estimator for the population mean.
26. Show that if T is a consistent estimator of θ, then t^2 is also a consistent estimator of θ^2
27. Find the maximum likelihood estimate of p for a binomial population with parameters (n,p).
28. The average height of 10 students who have an interest in playing basketball is 70 per inch with an SD of 2.5 inches. While 15 students who have no interest in playing basketball had a mean height of 67 inches, with an SD of 2.8 inches. Find the 95% CI for the difference of means.
29. In a sample of 20 persons from a town it was seen that 4 are suffering from T.B. Find a 95% confidence interval for the proportion of T.B patients in the town.
30. Distinguish between simple and composite hypotheses. Give one example for each.
31. Explain the chi-square test of goodness of fit.

(6 × 4 = 24 Marks)

PART D

Answer any ***two*** questions. Each question carries 15 marks

32. (a) Derive the distribution of the sample variance from a normal population.

    (b) A random sample of size 12 is taken from a normal population N(μ,3). Find the probability that the variance of the sample lies between 3.4 and 14.8.
33. (a) Explain the method of moments.

    (b) Suppose $X_1, X_2, \ldots, X_n$ is a random sample from the normal distribution with mean μ and variance σ^2, both unknown. Find the moment estimator for μ and σ^2
34. Obtain the 99% confidence interval for the mean and variance of a normal population N(μ,σ).

35. Following are the average weekly losses of work hours due to accidents in 8 industrial plants before and after a certain safety programme was put into operation.

Plant Number	1	2	3	4	5	6	7	8
Before	45	73	46	124	33	57	83	34
After	36	60	44	119	35	51	77	29

Test at 5% level of significance whether the safety programme is effective.

(2 × 15 = 30 Marks)

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