21U467S (Pages: 2) Name: ………………………

Reg. No: …………………..…

FOURTH SEMESTER B.Voc. DEGREE EXAMINATION, APRIL 2023

(Information Technology)

CC18U GEC4 ST11 - STATISTICAL INFERENCE AND APPLICATIONS

(2018 to 2020 Admissions – Supplementary/Improvement)

Time: Three Hours Maximum: 80 Marks

PART A

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

1. M.G.F of a Chi square random variable with 8 degrees of freedom is ………….
2. The standard deviation of a statistic is known as ………….
3. If $Z \sim N(0,1)$, then Z^2 follows …………. distribution.
4. The square of a t-variate with n degrees of freedom follows …………. distribution
5. Range of variation of Student's t distribution is ………….
6. Rejection of H_0 when H_0 is true is called ………….
7. The test for equality of variances of two normal populations is based upon …………. distribution.
8. A hypothesis which completely specifies parameters of the distribution followed by the population is called ………….
9. The test for goodness of fit is based upon …………. distribution.
10. Fisher-Neymann factorization theorem is used for finding …………. estimator.

(10 × 1 = 10 Marks)

PART B

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

11. Give examples for parameter and statistic.
12. Define Type 2 error.
13. What is sampling distribution?
14. Identify relationship between the mean and variance of chi-square distribution.
15. What is the relation between F and χ^2?
16. What is point estimation?
17. State Neymann Pearson lemma.
18. Define power of the test.
19. Which is the test statistic used to test the mean of a population when standard deviation is unknown?
20. Define F-distribution.
21. Find the moment estimator of the following distribution $f(x) = \theta e^{-\theta x}, x \geq 0; \theta \geq 0$.

22. What do you mean by small sample tests?

(8 × 2 = 16 Marks)

PART C

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

23. The means of two random samples of sizes 1000 and 2000 are 67.5 and 68.0 inches respectively. If the standard deviations of the samples are 4.5 and 3.8 respectively, examine whether means of the respective populations are significantly different.
24. Derive the sampling distribution of mean of samples from a normal population.
25. Explain the method of maximum likelihood.
26. If t is a consistent estimator of θ, then show that t^2 is also a consistent estimator of θ^2.
27. The mean of a random sample of size 400 taken from a population with variance 100 is 25 Construct 95% confidence limit for population mean.
28. A random sample of 500 apples was taken from a large consignment and of these 65 was bad. Estimate the proportion of bad apples by a 95% confidence interval.
29. . If $f(x) = \theta e^{-\theta x}, x \geq 0; \theta \geq 0$ and H_0: θ = 1 against H_1: θ = 2. Find power of the test based on a single observation which rejects H_0: where $X > 2$.
30. The theory predicts the proportion of employees of a company in five categories A, B, C, D and E follow the ratio 7:5:3:2:1 In an experiment among 1800 employees, the members in the five categories were 715, 488, 313, 196 and 88. Does the experimental result support the theory?
31. Define critical region and size of a test.

(6 × 4 = 24 Marks)

PART D

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

32. Explain the desirable properties of a good estimator.
33. (a) Derive the distribution of the statistic $t = \frac{Z}{\sqrt{\frac{Y}{n}}}$, where Z ~ N (0, 1) and Y ~χ^2_n.

    (b) Derive the m.g.f. of Chi-square distribution.
34. Explain the chi-square test for goodness of fit.
35. (a) Ten observations taken from a normal population are 88, 75, 82, 75, 68, 91, 76, 67, 89, 72. Based in this can we conclude that the population mean is greater than 80.

    (b) Explain the paired t-test.

(2 × 15 = 30 Marks)

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