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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, August 2022

First Degree Programme under CBCSS

Statistics

Complementary Course for Mathematics

ST 1431.1 : STATISTICAL INFERENCE

(2019 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. Define Consistency.
2. Obtain an unbiased estimator of population mean.
3. Define Confidence coefficient
4. Describe Null hypothesis.
5. What is a U.M.P. test?
6. Describe M.L.E.
7. Give the test statistics used to test the significance of population variance based on large samples.

8. Give the test statistics used to test the significance of mean based on small samples.

9. Describe critical region.

10. What is Experimental error?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Describe efficiency.

12. State Factorization theorem.

13. Obtain the moment estimator θ in the case of exponential distribution with mean $\frac{1}{\theta}$.

14. Distinguish between hypothesis and statistical hypotheses.

15. Explain the role of Neymann-Pearson lemma in testing of hypothesis.

16. Find 100 $(1 - \alpha)$% confidence interval of population proportion based on large samples.

17. Describe paired t-test.

18. Explain chi-square test for testing the significance of variance.

19. Discuss large sample test for testing the significance of population mean.

20. Define two-way classified data.

21. If t is an unbiased estimator of θ, examine whether t^2 is unbiased estimator of θ^2.

22. Find the M.L.E. of θ in $f(x, \theta) = \theta\, x^{\theta-1}, 0 < x \leq 1$.

23. What are the assumptions used in ANOVA?

24. Find 95% confidence interval for mean of a normal population with standard deviation 2, based on a sample of size 60 whose mean is 25.

25. Distinguish between type I and type II errors.

26. Find the consistent estimator of population mean of a normal population.

(8 × 2 = 16 Marks)

SECTION – C

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

27. Illustrate with an example that a consistent estimator need not be unbiased.

28. Examine the unbiasedness of the following estimators

$$t_1 = (X_1 + X_2 - X_3);\ t_2 = \frac{(X_1 + 2X_2 - X_3)}{2};\ t_3 = \frac{(X_1 + X_2 + X_3)}{3}.$$

where X_1, X_2, X_3 and iid random variables with $E(X_i) = \mu$ and $V(X_i) = \sigma^2$. Which of the above estimator is more efficient.

29. Find the moment estimators of the parameters of Normal distribution.

30. Obtain the $100(1-\alpha)\%$ confidence interval for the population variance.

31. Explain the large sample test for testing the equality of means of two independent normal populations.

32. Describe contingency table and discuss its applications in testing of hypotheses.

33. With usual notations, for a 2×2 contingency table, show that

$$\chi^2 = \frac{(ad - bc)^2 N}{(a+b)(a+c)(b+d)(c+d)}, \text{ where } N = a + b + c + d.$$

34. Explain *F*-test for equality of two variances.

35. Obtain the M.L.E. of P in binomial (n, P) distribution.

36. Explain how will you control the experimental error in ANOVA.

37. Describe the model, hypotheses to be tested and table in the case of two way ANOVA.

38. A random sample of 10 boys had the following I.Q. Do the data support the assumption that the mean IQ of the population is 100?

IQ : 70, 120, 110, 101, 88, 83, 95, 98, 107, 100.

($6 \times 4 = 24$ Marks)

SECTION – D

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

39. (a) Describe the method of interval estimation

(b) A die is thrown 9000 times and a throw of 3 or 4 observed 3240 times. Obtain the 95% confidence interval for P, the probability of getting 3 or 4.

(c) Find the M.L.E. of λ in Poisson distribution with parameter λ.

40. (a) Discuss large sample test for testing the equality of two population proportions.

(b) Before an increase in excise duty an tea, 800 persons out of sample of 1000 were found to be tea drinkers. After an increase in duty 800 persons out 1200 were tea drinkers. Examine whether there is a decrease in consumption of tea.

41. Discuss small sample tests for testing the

(a) equality of means

(b) equality of variances of two independent normal populations.

42. (a) Describe chi-square test for testing the independence of attributes.

(b) An automobile company gives the following information about age group and liking a particular model of car which it plans to introduce. Examine whether the model appeal is independent of age group.

	Age group			
	Below 20	20-39	40-59	≥ 60
Persons liked :	140	80	40	20
Disliked :	60	50	30	80

43. Explain the model and analysis of a one way ANOVA.

44. The following table gives the results of an experiment after applying seven varieties of seeds. Examine the significance of the effects of seeds at 5% level using ANOVA.

Varieties of seed	Observations							
1	12,	30,	10,	18,	24,	32,	29,	26
2	9	9	16	4				
3	30	7	21	9				
4	16	10	18	18				
5	18	24	12	19				
6	10	4	4	5				
7	17	7	16	17				

(2 × 15 = 30 Marks)