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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, August 2022

First Degree Programme Under CBCSS

Statistics

Complementary Course for Physics

ST 1431.2 — STATISTICAL INFERENCE

(2019 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. Distinguish between estimator and estimate.
2. What are the properties of a good estimator?
3. Define confidence interval.
4. Define likelihood function.
5. Define power of a test.
6. Explain statistical hypothesis.
7. Describe small sample tests.
8. Give the test statistics used to test the significance of population proportion.
9. What is ANOVA?
10. What are the principles of experimentation?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. Describe consistency. Give an example.

12. Find the M.L.E. of λ in $P(\lambda)$.

13. Explain the term standard error.

14. Describe efficiency.

15. Obtain an unbiased estimator of P in $B(1,P)$.

16. Explain the method of Interval estimation.

17. If t is an unbiased estimator of θ, examine whether $\sqrt{t}$ is unbiased estimator of $\sqrt{\theta}$ or not.

18. Distinguish between one tailed and two tailed tests.

19. State Neymann – Pearson lemma. Mention it uses.

20. Discuss large sample test for testing the significance of mean.

21. Give the test statistics used to test the homogeneity of attributes.

22. A random sample of 500 apples was taken from a large consignment and 50 were found to be bad apples. Find 95% confidence interval of the proportion of bad apples in the consignment.

23. Describe F-test for testing the equality of variance.

24. Give the test statistics used to test the significance of two means in the case of small samples.

25. Explain the assumption involved in one-way ANOVA.

26. Explain the term replication

(8 × 2 = 16 Marks)

SECTION – C

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

27. Define unbiasedness. Find an unbiased estimator of population variance. Examine whether it is consistent estimator.

28. Obtain the M.L.ES of μ and σ^2 in $N(\mu,\sigma^2)$.

29. State factorization theorem. Using the theorem obtain the sufficient estimator of the parameter in binomial distribution.

30. Obtain the confidence interval of variance of the normal population.

31. Describe the method of moments. Find the moment estimator of the parameter λ in Poisson distribution.

32. Explain chi-square test for goodness of fit.

33. Explain paired *t*-test.

34. A random sample of 10 boys had the following IQ. Do the data support the assumption that the average I.Q. is 100.

35. Let $(X_1, X_2 X_3, X_4, X_5)$ be random sample of size 5 drawn from $N(\mu,\sigma^2)$, considdr the following estimator of μ.

$t_1 = (x_1 + x_2 + x_3 + x_4 + x_5)/5$; $t_2 = (x_1 + x_2 - 2x_3 + x_4)$ $t_3 = (x_1 + 2x_2 + 3x_3 - x_4 - x_5)/4$. Are these estimators unbiased for μ. Which one is more efficient?

36. Explain how will you control experimental error using local control.

37. Explain the meaning and uses of ANOVA. How is ANOVA table set up? How the test based on it is performed?

38. Give the model, hypotheses to be tested and ANOVA table in the case of two way classified data.

(6 × 4 = 24 Marks)

SECTION – D

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

39. (i) Find 100 (1 – 2)% confidence interval of difference of proportions of two independent population.

(ii) In two large population there are 30 and 25 percent respectively of fair haired people. Is his difference likely to be hidden in samples of 1,200 and 900 respectively from the two populations?

40. Discuss large sample tests for testing (i) equality of two means (ii) equality of proportions. Based on sample observations drawn from two independent normal populations.

41. (i) Explain small sample test for testing the equality of two variances.

(ii) Two random sample gave the following results

	Sample size	Mean	S.S. deviation of the obsns. from mean
Sample I :	10	15	90
Sample II :	12	14	108

Test whether the variances are significant or not.

42. (i) Explain contingency table with usual notations show that for a 2 × 2 contingency table $x^2 = \frac{(ad - bc)^2 N}{(a+b)(c+d)(a+c)(b+d)}$, where $N = a + b + c + d$.

(ii) Describe chi-square test for independence of attributes.

43. Briefly explain the ANOVA in the case of one-way classified data.

44. The following table gives the life in hours of 4 batches of bulbs. Perform ANOVA and examine the significance of these four batches of bulbs.

Batches	Life in hours							
1	1800	1600	1610	1650	1680	1700	1720	
2	1580	1640	1640	1700	1750			
3	1460	1550	1600	1620	1640	1660	1740	1820
4	1510	1520	1530	1570	1600	1680		

(2 × 15 = 30 Marks)