R – 2341

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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2023

First Degree Programme under CBCSS

Statistics

Complementary Course for Physics

ST 1431.2 : STATISTICAL INFERENCE

(2017 Admission onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. Define point estimation.
2. Explain unbiasedness.
3. What is confidence coefficient?
4. Describe parametric space.
5. Define type II error.
6. What is the role of P-value in testing of hypothesis?
7. Define experimental error.
8. Describe large sample tests.

9. What are the main assumptions used in ANOVA?

10. Give the test statistics used to test the significance of proportion.

(10 × 1 = 10 Marks)

SECTION – B

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

11. Define consistency. Give one example of an estimator which is consistent.

12. Obtain an unbiased estimator of population mean.

13. State factorization theorem and mention one of its uses.

14. Give the $100(1-\alpha)\%$ confidence interval of population mean in $N(\mu, \sigma_0^2)$, σ_0^2 is a given value of σ^2.

15. Describe the method of maximum likelihood.

16. Distinguish between most powerful and uniformly most powerful tests.

17. A random sample of 900 members has a mean 3.4 and standard deviation 2.61. Is this sample came from a population with mean 3.25.

18. Discuss large sample test for testing the significance of population proportion.

19. Explain the use of standard error in testing of hypothesis.

20. Discuss chi-square test for testing the significance of population variance.

21. What are the principles of experimentation?

22. Give the situations underwhich ANOVA is used.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Let (X_1, X_2, X_3) be a random sample of size 3 drawn from a $N(\mu, \sigma^2)$ population. Consider the following estimators

$t_1 = (X_1 - X_2 + X_3)$; $t_2 = \frac{(X_1 + 2X_2 - X_3)}{2}$; $t_3 = \frac{(X_1 + X_2 + X_3)}{3}$. Are t_1, t_2 and t_3 unbiased estimators of μ. Which one is more efficient? Why?

24. Find the M.L.E. of the parameters of binomial distribution.

25. Describe the method of moment. Find the moment estimator of λ in $P(\lambda)$.

26. Obtain the confidence interval of σ^2 in $N(\mu, \sigma^2)$.

27. Explain large sample test for testing the equality of two population proportions.

28. Discuss chi-square test for homogenity.

29. Explain paired *t*-test.

30. Describe the technique of ANOVA. Also explain the meaning of F-coefficient used in this study.

31. State the mathematical model, hypothesis to be tested in one way ANOVA. Also prepare ANOVA table.

(6 × 4 = 24 Marks)

SECTION – D

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

32. (a) Explain the properties of M.L.E. Find the M.L.E. of μ and σ^2 in $N(\mu, \sigma^2)$.

(b) Obtain the moment estimators of α and β in $f(x, \alpha, \beta) = \frac{\beta^\alpha}{\Gamma\alpha} e^{-\beta x} x^{\alpha-1}$, $x \geq 0$.

33. Obtain the 100 $(1-\alpha)\%$ confidence interval of the difference of means of two independent normal populations with common unknown variance when

(a) Sample sizes are small

(b) Sample sizes are large.

34. (a) Explain chi-square test for goodness of fit.

(b) 200 digits are chosen at random from a random number table. Using chi-square test examine whether the digits are distributed equally frequently or not.

Digits :	0	1	2	3	4	5	6	7	8	9
Frequency :	18	19	23	21	16	25	22	20	21	15

35. (a) Explain two-way classified data

(b) Discuss the model, hypotheses to be tested, various sum of squares and ANOVA table in the case of two-way ANOVA.

(2 × 15 = 30 Marks)
