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Reg. No. : ....

Name : ....

Fourth Semester B.Sc. Degree Examination, March 2020

First Degree Programme Under CBCSS

Complementary Course for Mathematics

ST 1431.1: STATISTICAL INFERENCE

(2018 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. Define consistent estimator.

2. Define maximum likelihood estimator.

3. Discuss what you mean by confidence coefficient.

4. Describe P-value.

5. Define type I error.

6. Describe null hypothesis.

7. Define power of a test.

8. Define critical region.

P.T.O.

9. Identify composite hypothesis in the following

(a) $Ho: \mu = 0, \sigma^2 = 1$ in $N(\mu, \sigma^2)$

(b) $Ho: \lambda < 10$ in $P(\lambda)$

(c) $Ho: \mu = 0$ in $N(\mu, \sigma^2)$

10. Define chance causes of variation.

(10 × 1 = 10 Marks)

SECTION – B

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

11. Describe sufficient statistics.

12. Describe relative efficiency.

13. State factorization theorem. Mention its uses.

14. Prove that in sampling from normal population with mean μ and variance σ^2, sample mean is a consistent estimator of population mean.

15. State Neymann – Pearson lemma.

16. Distinguish between one tailed and two tailed tests.

17. A sample of 900 members has a mean 3.4 and standard deviation 2.61. Is the sample from a large population of mean 3.25 at 5% level?

18. A sample 15 values shows the standard deviation 6.4. Is this compatible with the hypothesis that the sample is from a normal population with standard deviation 5?

19. Discuss the test procedure for testing the significance of single proportion based on large samples.

20. Obtain the maximum likelihood estimator of μ based on a random sample of size n from $N(\mu, 1)$.

21. What are the assumptions used to conduct analysis of variance.

22. Explain the term randomization.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Let (x_1, x_2, x_3) be three independent observations drawn from a population with mean μ and variance σ^2. Consider the following estimators.

    $$t_1 = x_1 + x_2 - x_3; t_2 = 2x_1 + 3x_2 - \mu x_3$$

    Are t_1 and t_2 unbiased estimators of μ? Which one is more efficient?

24. Examine the consistency of sample variance based on a random sample of size n drawn from $N(\mu, \sigma^2)$ when

    (a) Sample size is small.

    (b) For large samples.

25. Describe the method of moment estimation.

26. Critically examine how interval estimation differ from point estimation?

27. Obtain the 100(1-2)-1- confidence interval for the mean of normal population when variance is unknown.

28. Discuss large sample test for testing the significant difference of two proportions.

29. Discuss χ^2-test for goodness of fit.

30. Height of 10 males in a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 68. Is it reasonable to believe that average height is greater than 64 inches (at 5% level).

31. Explain how will you control experimental error using replication.

(6 × 4 = 24 Marks)

SECTION – D

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

32. (a) Find a sufficient estimator of σ^2 based on a random sample of size n from $N(o,\sigma^2)$. Also find the 100(1- α)% confidence interval of $\sigma^2, n\,N(o,\sigma^2)$.

    (b) Find the maximum likelihood estimators of μ? and σ^2 based on a random sample of size n from $N(\mu,\sigma^2)$.

33. (a) Describe small sample test for testing the difference of means of two independent normal populations.

    (b) Below are given the gain in weights of Pigs fed on two diets A and B. Test whether the two diets differ significantly with respect to their gain in weight.

Gain in weight

Diet A 25, 32, 30, 34, 24, 14, 32, 24, 30, 31, 35, 25

Diet B 44, 34, 22, 10, 47, 31, 40, 30, 32, 35, 18, 21, 35, 29, 22

34. (a) Discuss F-test for testing the equality of two variances.

    (b) Discuss the additive model and hypotheses to be tested in a two way ANOVA.

35. Describe χ^2-test for independence of attributes out of 8000 graduates in a town 800 are females. Out of 1600 graduate employees 120 are females. Use χ^2-test to determine if any distinction is made, in appointment on the basis of sex.

(2 × 15 = 30 Marks)