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J – 1220

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) $H_0: \mu = 0, \sigma^2 = 1$ in $N(\mu, \sigma^2)$

(b) $H_0: \lambda < 10$ in $P(\lambda)$

(c) $H_0: \mu = 0$ 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 $100(1-2\alpha)\%$ 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 $N(0, \sigma^2)$. Also find the $100(1 - \alpha)\%$ confidence interval of σ^2 , $nN(0, \sigma^2)$.
- (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)