QP CODE: 19101464

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Reg No : ....

Name : ....

B.Sc DEGREE (CBCS) EXAMINATION, MAY 2019

Fourth Semester

Complemetary Course - ST4CMT04 - STATISTICS - STATISTICAL INFERENCE

(Common for B.Sc Computer Applications Model III Triple Main, B.Sc Mathematics Model I, B.Sc Physics Model I)

2017 Admission onwards

EB961C49

Maximum Marks: 80 **Time: 3 Hours**

Part A

Answer any **ten** questions.

Each question carries **2** marks.

1. What do you mean by estimation of parameters?
2. State the sufficient set of conditions for the consistency of an estimate.
3. How is efficiency of an estimator related to its variance?
4. How can we estimate the parameters using the method of moments?
5. Mention any two properties of maximum likelihood estimates.
6. What is the method of minimum variance?
7. A random sample of size 20 from a Normal population is found to have variance 0.2. Find a 99% confidence interval for the population variance.
8. What do you mean by a statistical test?
9. Define Type - I and Type - 2 errors .
10. Write down the test statistic for testing the equality of means of two populations when the population SDs (1) σ_1 and σ_2 are known (2) σ_1 and σ_2 are unknown.
11. Write the test statistic for testing the equality of proportions in two populations.
12. Give the test statistic in the case of small sample test to test whether the mean of a normal population has a specified value, (1) when population SD is known (2) when population SD is unknown.

(10×2=20)

Part B

Answer any **six** questions.

Each question carries **5** marks.

13. State and prove a sufficient set of conditions for the consistency of an estimate.

14. $x_1, x_2, \ldots, x_n$ is a random sample from a Normal population N(μ,σ) . Let $t_1 = x_1,\ \ t_2 = \frac{x_1+x_2}{2},\ \ t_3 = \frac{x_1+x_2+x_3}{3}, \ldots, t_n = \frac{x_1+x_2+\ldots+x_n}{n}$ are proposed estimates of μ . Compare the efficiencies of $t_1, t_2, \ldots, t_n$.

15. Show by an example "MLE need not be unbiased".

16. Find a lower limit for the variance of any unbiased estimator of θ , where $f(x) = \theta\, e^{-\theta \mathbf{x}};\ x > 0,\ \theta > 0.$

17. A random sample of size 17 from a Normal population is found to have sample mean as 4.7 and sample variance as 5.76. Obtain 90% and 95% confidence intervals for the mean of the population.

18. In a city, the milk consumption of families X is assumed to follow the distribution $f(x) = \frac{1}{\theta}\, e^{\frac{-\mathbf{x}}{\theta}}\ ;\ \ \theta > 0,\ x > 0.$ The hypothesis H_0 : θ = 5 is rejected in favour of H_1: θ = 10 if a family selected at random consumes 15 units or more. Obtain the probabilities of two types of errors.

19. From a population with unknown SD, a sample of size 100 was taken and its mean and SD were found to be 195 and 50. Examine whether the hypothesis that the mean of the population is 200 may be justified at 5% level of significance.

20. Explain paired t-test .

21. The following figures give the prices in rupees of a certain commodity in a sample of shops selected at random from a city A. 7.41, 7.77, 7.44, 7.4, 7.38, 7.93, 7.58, 8.28, 7.23, 7.52, 7.82, 7.71, 7.84, 7.63, 7.68. Assuming the distribution of prices to be normal, examine whether standard deviation of the prices is 0.3

(6×5=30)

Part C

Answer any **two** questions.

Each question carries **15** marks.

22. (1) State Neyman's condition for sufficiency
(2) Show that if σ² is known, sample mean $\bar{x}$ is a sufficient estimate of μ and if μ is known, then sample variance s² is not a sufficient estimate of σ² in the case of samples from N(μ,σ).

23. (1) Derive the confidence interval for the proportion of a binomial population
(2) A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Find 90% and 99% confidence intervals for the proportion of bad pineapples.

24. Fit a binomial distribution to the following data and test for the goodness of fit

variable	0	1	2	3	4
freq.	14	30	70	35	11

25. (a) How do you test for the equality of variances of two normal populations.
(b) Two random samples drawn from two normal populations are as follows: Sample 1 gives 20, 16, 26, 27, 23, 22, 18, 24, 25, 19. Sample 2 gives 27, 33, 42, 35, 32, 34, 38, 28, 41, 43, 30, 37. Test whether the two populations have the same variances.

(2×15=30)