QP CODE: 20100923

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Reg No : ....

Name : ....

B.Sc DEGREE (CBCS) EXAMINATION, MARCH 2020

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

476235C9

Time: 3 Hours

Marks: 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. What is a confidence interval?
2. Define unbiasedness.
3. Define sufficiency of an estimate.
4. How can we estimate the parameters using the method of maximum likelihood?
5. How do you examine whether there exists a minimum variance unbiased estimator for the parameter θ of a population with pdf f(x;θ)?
6. A random sample of size 11 from a Normal population is found to have variance 12.3. Find a 95% confidence interval for the population variance.
7. In a sample of 20 persons from a town, it was seen that 4 are suffering from T.B. Find a 95% confidence interval for the proportion of T.B patients in the town.
8. Write short note on simple and composite hypothesis.
9. Define significance level and power of a test.
10. The continuous random variable X has the density function $f(x) = \frac{1}{\theta};\ \ 0 < x < \theta.$ It is desired to test the hypothesis H_0 : θ= 1 against H_1: θ= 2 using a single observation x. x ≥ 0.95 is used as the critical region. Find the significance level of the test.
11. Write the test statistic for testing the mean of a population in large sample test when the population SD (1) σ is known (2) σ is unknown.

12. Give the test statistic in the case of small sample test to test the equality of means of two normal populations, (1) when population SDs are known (2) when population SDs are unknown.

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. $x_1, x_2, \ldots, x_n$ 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 $t_1, t_2, \ldots, t_n$.

14. Obtain a sufficient estimate of μ of N(μ,σ), when σ is known.

15. Examine whether $f(x) = (1+\theta)\, x^{\theta};\ \ 0 < x < 1$ admits a minimum variance estimator of θ . Find the lower limit for the variance of any unbiased estimator of θ from this population.

16. The mean and SD of the breaking strength of 100 cables tested by a company are 180 lbs and 25 lbs. Find 90% and 95% confidence limits for the mean breaking strength of all cables manufactured by the company.

17. The average hourly wage of a sample of 150 workers in a factory A was Rs. 25.6 with SD of Rs.1.08. The average hourly wage of a sample of 200 workers in a factory B was Rs. 28.7 with SD of Rs. 1.28. Find 99% and 95% confidence intervals for the difference of means.

18. An examination was given to 50 students at college A and to 60 students at college B. At A , the mean grade was 75 with SD 9 and at B, the mean grade was 79 with SD 7. Is there significant difference between the performance of the students at A and those at B (α = 0.05).

19. Describe the procedure for testing of homogeneity.

20. Ten individuals are chosen at random from a normal population and their heights in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71 and 71 inches. In the light of this data, discuss the suggestion that the mean height of the population is 66 inches.

21. The standard deviation of a sample of 15 from a normal population was found to be 7. Examine whether the hypothesis that the standard deviation is more than 7.6 is acceptable.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. Let p be the proportion of defective items produced by a machine. n items produced by the machine are examined and a random variable x_i is defined as: $x_i = 1$ if the i^{th} item examined is defective and $x_i = 0$ if it is not defective. Show that if $\sum_{i=1}^{n} x_i$ (1) $\frac{t}{n}$ is an unbiased estimate of p (2) $\frac{t(n-t)}{n(n-1)}$ is an unbiased estimate of p (1-p) (3) $\frac{t(t-1)}{n(n-1)}$ is an unbiased estimate of p².

23. Obtain the maximum likelihood estimates and moment estimates of parameters of Normal distribution.

24. Three students tossed a coin repeatedly and obtained the following results.

serial no. of student	no. of tosses	no. of heads obtained
1	60	35
2	80	48
3	120	50

Test the hypothesis that the coin is unbiased. It was suspected that the third student has used a coin different from that used by the other two. Is there any justification for this claim.

25. (a) How do you test for the equality of variances of two normal populations.
(b) The time taken by workers in performing a job by Method 1 and Method 2 are as follows. Method 1 gives 20, 16, 26, 25, 23. Method 2 gives 28, 33, 42, 35, 52, 34. Do the data show that the variances of time distribution by the two methods do not differ significantly.

(2×15=30)