22102806

QP CODE: 22102806

Reg No : .....

Name : .....

# B.Sc DEGREE (CBCS) REGULAR EXAMINATIONS, AUGUST 2022

## Fourth Semester

## Complementary 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)

2020 Admission Only

4658C9AB

Time: 3 Hours Max. Marks : 80

### Part A

*Answer any **ten** questions.*

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

1. What is a confidence interval?
2. Define consistency.
3. How is efficiency of an estimator related to its variance?
4. How can we estimate the parameters using the method of moments?
5. How can we estimate the parameters using the method of maximum likelihood?
6. How do you examine whether there exists a minimum variance unbiased estimator for the parameter $\theta$ of a population with pdf $f(x;\theta)$?
7. Give Cramer- Rao inequality and state clearly the assumptions.
8. What do you mean by a statistical hypothesis?
9. Define significance level and power of a test.
10. Write the test statistic for testing the mean of a population in large sample test when the population SD (1) $\sigma$ is known (2) $\sigma$ is unknown.
11. Write down the test statistic for testing the equality of means of two populations when the population SDs (1) $\sigma_1$ and $\sigma_2$ are known (2) $\sigma_1$ and $\sigma_2$ are unknown.
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. $x_1, x_2, x_3$ are three independent observations from a population with mean μ and variance $\sigma^2$ . If $t_1 = x_1 + x_2 - x_3$ and $t_2 = 2x_1 + 3x_2 - 4x_3$, compare the efficiencies of $t_1$ and $t_2$.

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

15. Derive the maximum likelihood estimators of the parameters of Normal distribution $N(\mu, \sigma)$.

16. The mean of a sample of size 20 from a normal population N( μ , 8) was found to be 81.2. Find 90% and 95% confidence intervals for μ.

17. If 8.6, 7.9, 8.3, 6.4, 8.4, 9.8, 7.2, 7.8, 7.5 are the observed values of a random sample of size 9 from N(8, $\sigma^2$ ), obtain 90% confidence limits for the population variance $\sigma^2$.

18. It is decided to test $H_0$: $p = \frac{1}{2}$ against $H_1$ : $p = \frac{2}{3}$ where p denotes the probability of getting head when a coin is tossed, by tossing the coin 4 times and rejecting the hypothesis if all the four throws result in heads. Obtain the level of significance and power of the test.

19. Describe the procedure for testing of independence of attributes.

20. The following observations came from a Normal population, 47, 49, 63, 45, 53. Test whether the mean of the population is 55.

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. Show by an example each of a case where the estimate is (1) not unbiased but consistent (2) unbiased but not consistent.

23. (1) Derive the confidence interval for the proportion of a binomial population
(2) 150 heads and 250 tails resulted from 400 tosses of a coin. Find 90% and 95% confidence intervals for the proportion of head.

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

| variable | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| freq. | 48 | 27 | 12 | 7 | 4 | 1 | 1 |

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)