QP CODE: 25019737

25019737

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS)) REGULAR/ IMPROVEMENT/ REAPPEARANCE / MERCY CHANCE EXAMINATIONS, FEBRUARY 2025

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)

2017 Admission Onwards

4C39397E

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Define point estimation.
2. Define unbiasedness.
3. State Neyman's condition for sufficiency.
4. What is the method of minimum variance?
5. Obtain the estimate of the parameter μ of Normal distribution $N(\mu, \sigma)$ by the method of moments.
6. Give Cramer- Rao inequality and state clearly the assumptions.
7. 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.
8. Distinguish between one tailed test and two tailed test.
9. What do you mean by critical region?
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 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. Show that if T is a consistent estimator of θ , then T^2 is also a consistent estimator of θ^2.

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. Explain the method of maximum likelihood.

16. The diameters of 200 ball bearings made by a machine during a week were found to have a mean 0.824 and SD 0.042. Find 90% and 95% confidence intervals for the mean diameter of the ball bearings.

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. A sample of 900 items is found to have a mean of 3.41 gms. Can it be reasonably regarded as a random sample from a large population whose mean is 3.21 gms and SD 2.63 gms.

19. A sample of 200 boys who passed S.S.L.C examination is found to have mean mark 50 with SD 5 for English. The mean mark of 100 girls was found to be 48 with SD 4 for English. Does this indicate any significant difference between the abilities of boys and girls assuming the SD's the same.(α = 0.05)

20. A group of 10 children were tested to find out how many digits they could repeat from memory after hearing them once. They were given practice at this test during the next week and were then tested. Is the difference of the performance of the 10 children at the two sets significant?

child	A	B	C	D	E	F	G	H	I	J
test 1	6	5	4	7	8	6	7	5	6	8
test 2	7	7	6	7	9	6	8	6	6	10

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. (1) State Neyman's condition for sufficiency

(2) Show that if σ^2 is known, sample mean $\bar{x}$ is a sufficient estimate of μ and if μ is known, then sample variance s^2 is not a sufficient estimate of σ^2 in the case of samples from $N(\mu,\sigma)$.

23. (1) Derive the confidence interval for the proportion of a binomial population

(2) In a sample of 20 persons from a town, it was seen that 4 are suffering from T.B. Find 95% and 99% confidence intervals for the proportion of T.B patients in the town.

24. Five dice were thrown 96 times and the number of times, at least one die showed an even number is given below. Test whether the dice are unbiased.

no. of dice showing even number	5	4	3	2	1	0
frequency	7	19	35	24	8	3

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)