21102903

QP CODE: 21102903

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) EXAMINATIONS, OCTOBER 2021

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)

2019 Admission only

69641B5C

Time: 3 Hours

Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. What do you mean by interval estimation?
2. Define unbiasedness.
3. Define sufficiency of an estimate.
4. How can we estimate the parameters using the method of moments?
5. What is the method of minimum variance?
6. Obtain interval estimate of the mean of Normal population if S.D σ is unknown.
7. Obtain the confidence interval for the variance of Normal population.
8. What do you mean by a statistical hypothesis?
9. Define significance level and power of a test.
10. State Neyman - Pearson theorem in testing of statistical hypothesis.
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 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 by an example of a case where the estimate is not unbiased but consistent.

14. x_1, x_2, x_3 are three independent observations from a population with mean μ and variance σ^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.

15. 1, 5, 2, 4 is a sample from a population with pdf $f(x) = p(1-p)^x$; $0 < p < 1$, $x = 0, 1, 2, \ldots$Fnd mle of p.

16. A random sample of size n is taken from a Normal population with mean 0 and variance σ^2. Examine whether $\frac{1}{n} \sum_{i=1}^{n} x_i^2$ is a minimum variance unbiased estimate of σ^2.

17. The average height of 10 students who have interest in playing basket ball is 70 inches with a SD of 2.5 inches while 15 students who have no interest in playing basket ball had a mean height of 67 inches with a SD of 2.8 inches. Find 95% confidence interval for the difference of means.

18. The continuous random variable X has the density function $f(x) = \frac{1}{\theta}$; $0 \leq x \leq \theta$. It is desired to test the hypothesis $H_0 : \theta = 1$ against $H_1 : \theta = 2$ using a single observation x. Obtain the probabilities for type 1 and type 2 errors if we choose (1) $0.5 \leq x$ (2) $1 \leq x \leq 1.5$ as the critical regions.

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.($\alpha = 0.05$)

20. A farmer grows crops on two fields A and B. On A, he puts Rs. 100 worth of manure per acre and on B, he puts Rs. 200 worth of manure per acre. The yields per acre for 5 years is given below. Examine whether costly manure has resulted in increased yields.

year	1	2	3	4	5
yield from A	34	28	42	37	44
yield from B	36	33	48	38	50

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) Out of 250 insects treated with a certain insecticide, 150 were killed. Obtain 99% and 95% confidence intervals for the proportion of insects likely to be killed by this insecticide in future use.

24. Survey of 320 families with 5 children each revealed the following distribution. Is the result consistent with the hypothesis that male and female births are equally probable.

no. of boys	0	1	2	3	4	5
no. of girls	5	4	3	2	1	0
no. of families	12	40	88	110	56	14

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)