23106460

QP CODE: 23106460

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) IMPROVEMENT / REAPPEARANCE EXAMINATIONS, MARCH 2023

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

2348CDFA

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Differentiate between point estimation and interval estimation.
2. Define consistency.
3. State Neyman's condition for sufficiency.
4. How can we estimate the parameters using the method of moments?
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. Obtain the estimate of the parameter θ of Uniform distribution U(0,θ), by the method of moments.
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. Define power of a test. Mention its relationship with probability of type - 2 error.
10. For a population with p.d.f $f(x) = (1+\theta)\, x^{\theta};\ \ \theta > 0,\ \ 0 \leq x \leq 1$, and zero elsewhere, the hypothesis H_0: θ = 1 is to be tested based on a single observation taken from the population. It is suggested to reject the hypothesis if the observation x is less than 0.6. Find the significance level of the test if H_1: θ = 1.5 is the alternate hypothesis.

11. Distinguish between large sample and small sample.

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. Show by an example of a case where the estimate is unbiased but not 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. Explain the method of maximum likelihood and the method of moments in estimation.

16. Examine whether there exists a minimum variance estimator for the parameter λ of Poisson distribution.

17. A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Find 99% and 95% confidence intervals for the proportion of bad pineapples.

18. The records of a certain hospital shows the birth of 723 males and 617 females in a certain week. Do these conform to the hypothesis that the males and females are born in equal proportions (significance level= 0.05).

19. In an experiment of breeding pea plants, Mendel obtained the following results. RY = 315, WY = 101, RG = 108, WG = 32 . Theory indicates that the frequencies should be in the ratio 9 : 3: 3 : 1. Examine the agreement between theory and observations.

20. Three women take an advanced typing course in order to increase their speed. Before the course, their speeds are 40, 42 and 40 words per minute. After the course, their speeds are 45, 50 and 42 words per minute respectively. Is the course effective?

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 mean μ of Normal distribution when SD σ is known and unknown.
(2) 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.

24. A sample of size N is taken from a binomial population with parameters n and p of which n is known. Find the most powerful critical region of size α for testing H_0: $p = p_0$ against H_1: $p = p_1$.

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)