QP CODE: 24021043

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Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR EXAMINATIONS, APRIL 2024

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

61DB4642

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. How can you define relative efficiency?
3. State Neyman's condition for sufficiency.
4. How can we estimate the parameters using the method of moments?
5. Obtain interval estimate of the mean of Normal population if S.D σ is unknown.
6. Obtain the confidence interval for the variance of Normal population.
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. Distinguish between null hypothesis and alternate hypothesis.
9. Define significance level and power of a test.
10. If $x \geq 1$ is the critical region for testing θ= 2 against the alternative θ=1 on the basis of a single observation from the population with pdf $f(x) = \theta\, e^{-\theta x};\ \ x > 0$, obtain the power of the test.
11. What is a contingency table?
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 and x_2 are two independent observations from a population with mean μ and variance σ^2. If $t_1 = \frac{x_1+x_2}{2}$ and $t_2 = \frac{2x_1+3x_2}{5}$, 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. Explain the method of maximum likelihood.

16. Estimate θ by the method of moments if $f(x) = \frac{2(\theta-x)}{\theta^2};\ 0 < x < \theta$, when the mean of a sample is 3.5.

17. 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.

18. A factory was producing electric bulbs of average length of life 2000 hours with SD 300. A new process was introduced with the hope that life length of bulbs would increase. A sample of 50 bulbs produced by the new process was found to have an average life length of 2200 hours. Examine whether it is reasonable to think that life length of bulbs has increased assuming the SD has not changed (significance level = 0.05).

19. In a survey of 70 business firms, it was found that 45 are planning to expand their capacities next year. Does the sample information contradict the hypothesis that 70% of the firms are planning to expand next year?

20. 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.

21. The standard deviations of two samples of size 10 and 14 from two normal populations are 3.5 and 3 respectively. Examine whether the standard deviations of the populations are likely to be equal.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Show that sample variance is not unbiased but consistent estimator of population variance when samples are taken from Normal population N(μ, σ).

23. (1) Derive the confidence interval for the difference of means of two populations.

(2) The average hourly wage of a sample of 150 workers in a factory A was Rs. 25.6 with SD of Rs.10.8. The average hourly wage of a sample of 200 workers in a factory B was Rs. 28.7 with SD of Rs. 12.8. Find 99% and 95% confidence intervals for the difference of means.

24. (1) Explain the procedure for testing the equality of means of two populations in large sample theory.

(2) Random samples of sizes 500 and 400 are found to have means 11.5 and 10.9 respectively. Can the samples be regarded as random samples from the same population whose SD is 5?

25. (1) Explain paired t- test.

(2) 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

(2×15=30)