QP Code: U25C028

Reg. No : ....

Name : ....

ST MARY'S COLLEGE (AUTONOMOUS), THRISSUR-20

III SEMESTER (FYUGP) DEGREE EXAMINATIONS, OCTOBER 2025

STA3MN201 : STATISTICAL INFERENCE USING R

2024 Admission Onwards

(Credits: 4)

Time: 2 Hours **Maximum Marks: 70**

Section A

*Answer **all**. Each question carries **3** Marks* ***(Ceiling: 24 Marks)***

1. Give the large sample confidence interval for μ where samples are taken from normal population with unknown variance.
2. Let $X_1, X_2, \ldots, X_n$ be a random sample drawn from a given population with mean μ and variance σ^2. Show that the sample mean $\bar{X}$ is an unbiasd estimator of population mean μ.
3. Define sufficiency.
4. Distinguish between size and power of a test.
5. Write down the large sample test statistic for testing the mean of a population when the standard deviation of the population is known.
6. Distinguish between null and alternative hypothesis.
7. State any two applications of Chi-square distribution.
8. Interpret the following R code:
   hist(data, col="blue", main="Histogram", xlab="values").
9. Write R code to perform the following:
   (a) Create a vector containing integers from 1 to 10
   (b) Access the fifth element of the vector
   (c) Access the elements in the interval [3, 9]
10. Write the R command to sort the values 5, 2, 9, 1 in descending order.

Section B

*Answer **all**. Each question carries **6** Marks* ***(Ceiling: 36 Marks)***

11. Obtain 95% confidence interval for the mean of a normal population with standard deviation 3 based on 16 samples taken from this population, where the sample mean was calculated as 10.5.
12. Examine sufficiency of $\sum_{i=1}^{n} x_i^2$ for σ^2 in the $N(0, \sigma^2)$ distribution.

Turn Over

13. Explain the method of moments of estimation.

14. A random sample of 700 apples was taken from a large consignment and of these 70 were taken to be bad. Can it be taken that 15% of the apples in this consignment are bad?. Test at 5% level of significance.

15. Find the probabilities of type I error and the power of the test which rejects H_0 if $x > 1 - \alpha$, if X has p.d.f of the form $f(x) = \theta x^{\theta - 1}, \quad 0 < x < 1$, with $H_0 : \theta = 1$ and $H_1 : \theta = 2$.

16. The mean lifetime of a sample of 100 light bulbs produced by a company is computed to be 1570 hours, with a standard deviation of 120 hours. Test the hypothesis that the mean lifetime of all the bulbs manufactured by the company is 1600 hours at 5% level of significance.

17. Using the following data on 300 adult males, identify whether smoking and heart disease are independent.

	Heart diseased	Not diseased
Smokers	75	105
Non- smokers	25	95

18. Write R code to compute the mode for the following data.

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	12	28	40	15

Section C

*Answer **any one**. Each question carries **10** Marks* ***(1x10=10marks)***

19. (a) Explain the method of maximum likelihood.
(b) Prove that for the binomial population with density function.
$f(x,p) = \binom{n}{x} p^x q^{n-x}, \quad x = 0, 1, 2...n$, the maximum likelihood estimator for p is $\frac{x}{n}$

20. (a) Explain Chi square test of goodness of fit.
(b) The number of television sets sold by a company in seven major cities during one-month period were 120, 185, 260, 190, 210, 175, and 260, respectively. Does this information help us to conclude that all the seven cities have the same sale potential?

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