

No. of Printed Pages : 3 **MSTL-013(Set-I)**

M. SC. (APPLIED STATISTICS)
(MSCAST)

Term-End Practical Examination

June, 2025

MSTL-013(Set-I) : STATISTICAL COMPUTING
USING R-III

Time : $2\frac{1}{2}$ Hours

Maximum Marks : 50

Note : (i) Attempt any *two* questions.

(ii) Solve the questions using R-software and create a script file.

(iii) Mention necessary steps, hypotheses, interpretation, etc.

(iv) Symbols have their usual meanings.

1. Using R, generate the population for size 100 for both the study variable y (monthly electricity consumption) and the auxiliary variable x (house size in square metres). Select a sample of size 25 using Simple Random Sampling Without Replacement

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(SRSWOR), compute the ratio estimator, estimate the MSE, and compare the efficiency of the ratio estimator to the estimator obtained by SRSWOR using R. 25

2. (a) The observations of a random sample of size 10 from a distribution which is continuous and symmetric about its median are given as follows :

20.2, 24.1, 21.3, 17.2, 19.8, 16.5, 21.8, 18.7, 17.1, 19.9

Write R code for Wilcoxon test, to test the hypothesis that the sample is taken from a population having median greater than 18 at 5% level of significance.

10

- (b) Draw 1000 samples from an exponential distribution with rate parameter $\lambda = 1$ using the metropolis algorithm. Use a normal proposal distribution centered at the current state with a standard deviation of 1. Visualise the results with a histogram.

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Compare the histogram to the exponential density curve. 15

3. (a) Given the vector $X = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$ and a matrix

$A = \begin{bmatrix} -3 & 5 \\ 4 & -2 \end{bmatrix}$. Compute the quadratic

form $Q(x) = X^T A X$ in $\mathbb{R}$. 10

(b) Write R code to compute the spectral decomposition for the given matrix : 15

$$D = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$$

x x x x x