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

M. SC. (APPLIED STATISTICS)

(MSCAST)

Term-End Practical Examination

June, 2025

MSTL-013(Set-II) : 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.

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1. Using R, generate the population for size 80 for both the study variable y and the auxiliary variable x. Select a sample of size 20 using Simple Random Sampling Without Replacement (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 cars that enter in a parking are classified either Foreign made (F) or Indian made (I). To check that the cars entering in the parking are in random order, a sample of first 40 cars that entered in the parking is taken and found the following sequence :

IIFFFIFIFFFFIIFIIIFFIFFIFFFFIIFFF IFFIIII

Use R, to test that the cars enter in the parking are in random order at 1% level of significance. 10

(b) Using R, implement Gibbs sampling to generate samples from a Bivariate Normal Distribution with the following Parameters : 15

$$\mu = \begin{bmatrix} 2 & -1 \end{bmatrix}, \Sigma = \begin{bmatrix} 4 & 2 \\ 2 & 3 \end{bmatrix}$$

3. (a) Given the matrix $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \\ 2 & 5 \end{bmatrix}$. Use the Gram-Schmidt process to orthogonalizes the columns of A. 10

(b) Using R, perform the eigen decomposition for the given matrix : 15

$$D = \begin{bmatrix} 2.3 & 1.2 & 0.9 \\ 1.2 & 2.0 & 1.1 \\ 0.9 & 1.1 & 1.8 \end{bmatrix}$$

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