No. of Printed Pages : 4 **MSTL-013(Set-II)**

M. SC. (APPLIED STATISTICS)

(MSCAST)

Term-End Practical Examination

June, 2026

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, hypothesis, interpretation, etc.

(iv) Symbols have their usual meanings.

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1. (a) Compute the Eigen decomposition for the following matrix : 10

$$B = \begin{bmatrix} 6 & 2 & 1 \\ 2 & 3 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

(b) A random sample of 12 patients was selected and their blood sugar levels (mg/dL) after fasting are given as follows : 98, 110, 102, 104, 100, 99, 108, 115, 120, 103, 97, 112. Assuming that the distribution of blood sugar levels is symmetric about its median and continuous, is there evidence to suggest that the median fasting blood sugar level is 105 mg/dL at a 5% level of significance. 15

2. Generate a population of size 50 for both the study variable Y and the auxiliary variable X. From this generated population select a sample of size 10 using Simple Random Sampling without Replacement (SRSWOR). Compute the regression estimator of population mean of the study variable. Estimate its MSE, and compare the efficiency of the ratio estimator to the usual mean estimator obtained by SRSWOR. 25

3. (a) Suppose a researcher is interested to study correlation between students'

ranks in History and Geography. The ranks of 10 students are as follows :

Student	Rank in History	Rank in Geography
1	1	6
2	3	2
3	5	3
4	6	5
5	7	10
6	8	4
7	9	9
8	2	1
9	4	7
10	10	8

Perform Kendall's tau test using R. 10

(b) Implement the metropolis algorithm to sample from a Gamma distribution with shape parameter $\alpha = 2$ and rate parameter $\beta = 2$. Use a normal

distribution centred at the current state with a standard deviation of 1 as the proposed distribution. Using R, generate 1000 samples and visualize the results with a histogram. Overlay the true Gamma density curve for comparison. 15

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