

M. SC. (APPLIED STATISTICS)
(MSCAST)

Term-End Examination

June, 2025

MST-015 : INTRODUCTION TO R SOFTWARE

Time : 2 Hours

Maximum Marks : 25

Note : (i) *Question No. 1 is compulsory.*

(ii) *Attempt any **two** questions out of the remaining Question Nos. 2 to 4.*

(iii) *Use of scientific calculator (non-programmable) is allowed.*

(iv) *Symbols have their usual meanings.*

1. Answer the following : 5×1=5

(a) Write a command to get help on the **for** reserved word.

- (b) Differentiate between the use of the **sep** and **collapse** arguments of the **paste()** function.
- (c) Write the output of the following statement :

is.na (c(9, -2, 0, NA, NaN, 10))

- (d) Which of the following user defined function names is inappropriate and why ?
- (i) **matrix**
- (ii) **abs**
- (e) Write an assignment statement equivalent to the following equation in R :

$$\text{Area} = 2\pi r^2 + 2\pi rh$$

2. (a) Write R code to create the graph of the following function : 3

$$f(x) = |x|, \quad -5 \leq x \leq 5$$

- (b) Consider the following data : 3

37, NA, 30, 49, 110, 96, NA,

23, 21, 7, 21, 9, NA, 37, 30, 30, 21

Write R commands to perform the following tasks :

- (i) Remove NA's from this data and save it under the name **Air**.
 - (ii) Create a histogram by specifying the colors for filling bars.
 - (iii) Extract the frequency distribution corresponding to the histogram.
- (c) Write an **if-else** statement to compute the value of y , where : 4

$$y = \begin{cases} 4x^3 \text{ and increase } x \text{ by } \frac{1}{2}, & \text{if } x \leq 4 \\ 4(x-1)^2 \text{ and decrease } x \text{ by } \frac{1}{2}, & \text{if } x > 4 \end{cases}.$$

3. (a) Write R commands to create a function to compute the variance of the following discrete frequency distribution : 3

$$x_i | f_i, \quad i = 1, 2, 3, 4$$

- (b) Consider the following height and weight data : 3

Height (in inches)	Weight (lbs)
57	113
58	116
59	118
60	121
61	124
62	127
63	130
64	132
65	135
66	138

Create a data frame named **DF** of the data and write R commands to do the following tasks :

- (i) Extract the first 9 rows of the data frame and assign it under the name **women**.
- (ii) Compute the Karl Pearson's correlation coefficient between the columns of **women**.
- (iii) Create scatter plot of the variables of **DF** in a single plot.
- (c) Write step-by-step execution of the following code : 4

```

m <- 6
while (m > 3) {
  n <- m %/% 2
  if (n==0) m <- m*5 else m <- m - 1
}
Cat ("n=", n, "m=", m)

```

4. (a) Consider the following three matrices :4
- ```

A <- matrix (1 : 4, nrow = 2)
B <- matrix (rep(1, 4), ncol = 2)
C <- matrix (5 : 8, nrow = 2,
ncol = 2)

```

Create the matrices and write the outputs of the following commands :

- (i) **A – C + B % \* % C**
  - (ii) **cbind (A, B)**
  - (iii) **diag(C)**
  - (iv) **A[1, ]**
- (b) Write R commands to create a .csv file consisting of the following data : 4

| <b>Air.<br/>Flow</b> | <b>Water.<br/>Temp</b> | <b>Acid.<br/>Conc.</b> | <b>Stack.<br/>loss</b> |
|----------------------|------------------------|------------------------|------------------------|
| 80                   | 26                     | 90                     | 42                     |
| 80                   | 24                     | 89                     | 37                     |
| 75                   | 22                     | 91                     | 37                     |
| 62                   | 21                     | 88                     | 28                     |
| 62                   | 23                     | 94                     | 18                     |

If the data is saved in SL.csv file, then read the data and name it as **SLOSS**. Also, write R commands to :

- (i) Name the rows as **Row1, Row2, Row3, Row4** and **Row5** and

columns as **Col1**, **Col2**, **Col3** and **Col4**.

- (ii) Compute the row means and column sums of the data frame.
  - (iii) Sort **SLOSS** according to the **Col2** of it.
- (c) Write R commands to get the following outputs : 2
- (i) **a##1\$, b##3\$, c##5\$**
  - (ii) **A:1, B:2, C:3, D:4**

x x x x x