MST–015

M. Sc. (APPLIED STATISTICS) (MSCAST)

Term-End Examination
June, 2024

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) What is the full form of CRAN ?

    (b)   Is there any difference between the usage of '?' and '??' operators for help ?

    (c) Write the output of the following statement :

    $$\mathbf{rep}\big(x = 2 : 4, \mathbf{each} = 4\big)$$

(d) Which of the following user defined function names are inappropriate and why ?

(i) **mean**

(ii) **exp**

(e) Write an assignment statement equivalent to the following equation in R :

$$E = \frac{mc^2}{\sqrt{1 - \dfrac{V^2}{c^2}}}$$

2. (a) Write step-by-step execution of the following code :

sum ← 0

for (i in c (6, 9)){

for (j in c (1, 4)){

sum ← sum + choose (i, j) * x [i, j]}

}

(b) The following funds were disbursed during 2010 to 2014 by a leading financial institution :

Year	Amount (₹ in lakh)
2010	1,400
2011	1,500
2012	1,900
2013	2,200
2014	3,000

Write R commands to create a pie chart of the data and to add colors, main title, labels name and percentages to the created pie chart.

(c) Use **mapply( )** function to generate 3, 6, and 9 uniform numbers in the range 0 to 1 in a single command.   5+3+2

3. (a) Write step-by-step execution of the following code :

$y \leftarrow 5$

$p \leftarrow 1$

if $(y >= 0)${

   while $(y > 0)${

        P $\leftarrow$ P * y ; print (P)

        y $\leftarrow$ y – 1; print (y)}

} else {

   while $(y < 0)$}

        $p \leftarrow p / y$; **print (P)**

        $y \leftarrow y + 1$; **print** (y)}

}

print (P)

(b) Write the general syntax of **for** and **while** loops in **R**. Also, explain their executions with the help of some examples.

(c) Create a function that computes the geometric mean and harmonic mean of the following type of data :   4+3+3

Observation	Frequency
x_1	f_1
x_2	f_2
x_3	f_3
x_4	f_4
x_5	f_5
x_6	f_6

4. (a) Create two matrices A and B with the following elements :

$$A = \begin{pmatrix} 1 & -1 & 3 \\ 2 & 2 & 2 \\ 0 & 1 & 1 \end{pmatrix} \text{ and } B = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{pmatrix}$$

Write R commands to do the following task :

(i) Multiply the two matrices.

    (ii) Obtain the determinant of the matrix A.

    (iii) Obtain a vector of the elements of the principle diagonal of A.

    (iv) Create a function named **comb**, which combines these two matrices rowwise and columnwise. Also print the output.

(b) Write R commands to create a .txt file with name ↓ stack .txt consisting of the following data :

Air. Flow	Water. Temp.	Acid. Conc.	Stack. loss
81	27	90	43
81	25	89	38
76	23	91	38
63	22	88	29
63	24	94	19

Read the data and assigned it to **Stack Loss**. Then write R commands to :

(i) **Col1, Col2, Col3** and **Col4**.

(ii) Compute the row means and column sums of the data frame.

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(iii) Sort **Stack Loss** data according to the **Col2** of it.

(c) Find the error in the following code :

hist (*x*, col = lightblue, breaks = 10,

title = Histogram of *x*, axes = TRUE,

labels = TRUE)

Also, rewrite the corrected code.   4+4+2