(i) product of square roots of 30 and 50.

(ii) sum of 3rd and 5th power of pi.

(iii) sum of squares of positive divisors of 3.

(b) Write commands to

(i) read character data from the file 'names.csv'.

(ii) enter the names of months of the year having 31 days.

(iii) make a new vector from the vectors obtained in part (i) and (ii).

(c) Write commands to

(i) get the list of objects that end with 'e'.

(ii) to remove the list of all objects having letter 'b' in their name.

(iii) to get the list of all objects starting with either 'a' or 'e'

(d) Write commands to

(i) convert a vector v containing names of days of the week into numeric vector w.

(ii) get the structure of v and w.

(iii) get the structure of all available objects with 'data' in their name.

(13/5/2022 Mor)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1075 **A**

Unique Paper Code : 32353401

Name of the Paper : SEC-2 Computer Algebra Systems and Related Softwares

Name of the Course : **B.Sc. (Hons.) Mathematics**

Semester : IV

Duration : 2 Hours Maximum Marks : 38

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **six** questions in all.
3. **Q1** and **Q4** are compulsory. Attempt any **two** questions from the rest.

UNIT – 1 (CAS)

Note : The answers should be written in only **one** of the CAS:Mathematica/MATLABMaxima/Maple or any other.

P.T.O.

1. Fill in the blanks : **(Any ten)** (10)

(a) Numerical value of $\frac{5}{7}$ up to 10 places are given by command _____

(b) Command for Square of a previous output is _____

(c) Command for 100! is _____

(d) The output for ArcTan[$\frac{1}{4}$] is _____

(e) The command for 7 mod 3 is _____

(f) The command for numeric value of $\sqrt{3}\sqrt{5}$ is _____

(g) Command for numerical approximation to 13^{20} with 15 significant digit is _____

(h) Command for the Table of the squares of the first five positive whole numbers is _____

(i) _____ is used to plot an implicitly defined function.

(j) The command _____ will produce a formatted rectangular array with brackets on the sides.

(k) The symbol _____ will simply multiply corresponding entries in the two matrices.

(ii) For the samples:

sample1: 5, 6, 9, 12, 8
sample2: 7, 9, 13, 10

Write the command to make a data frame.

(b) (i) Write a command to create a pie chart with labels for the following datas :

data1: 3 5 7 5 3 2 6 8 5 6 9 8
data2: "Jan" "Feb" "Mar" "Apr" "May" "Jun" "Jul" "Aug" "Sep" "Oct" "Nov" "Dec".

(ii) Find the minimum value of data1.

(c) (i) Using scan command enter the following data: vegetables={carrot, onion, peas, brinjal}

(ii) Put the items in alphabetical order using a command.

(d) (i) Give a command to read a file of data from a disk.

(ii) Write any command that produces multiple values as a result of the data.

6. Answer any **two** parts from the following : (4.5×2=9)

(a) Write commands to evaluate

(e) The data must be all numbers or all characters to form a matrix.

(f) The NA is a special R object and always used as a character.

(g) The quantile () command is to produce 25%, 50%,75%, 100%.

(h) To access the elements of data objects ,you can use $.

(i) The data frame can not handle mixed data.

(j) The length of the following vector is 7:

week={Sun,Mon,Tue,Wed,Thu,Fri,Sat,NA}

(k) To combine data samples, you can use cbind() command.

(l) To examine the mean of the third row of a matrix named birds, you can use the command means(birds,[3,]).

5. Answer any **two** parts from the following : (4.5×2=9)

(a) (i) Consider the data 1=5,8,3,1,9,2,4,4,7,3. Write a command to remove the values 1,9,2 from the data1

(1) The command for natural logarithm is _____

2. Answer any **two** parts from the following : (4.5×2=9)

(a) Define the function f(x) = cos 3x +sin 3x. Find its derivative and integral between the limits [0,π/3] and write the commands for the same.

(b) Write command for sketching the curve :

$x = 1 + \text{Sin}(t)$

$y = 2\text{Cos}(2t), \{t, 0, 2\pi\}$

(c) Let $A = \begin{bmatrix} 2 & 4 & 5 \\ 3 & 1 & 8 \\ 7 & 3 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 7 & 5 & 1 \\ 1 & 4 & 2 \\ 3 & 1 & 2 \end{bmatrix}$

Write command for generating

(i) Matrix (A + B).

(ii) Matrix Multiplication of A and B.

(iii) Pointwise Multiplication of A and B.

(d) Write command for generating graph of the surface :

$z = e^{-\left(\frac{x^2}{2}+\frac{y^2}{2}\right)}$ for $-5 \le x, y \le 5$.

P.T.O.

3. Answer any **two** parts from the following : (4.5×2=9)

(a) Write a command to find the adjoint of matrix

$$A=\begin{pmatrix}1 & 1 & 0\\ 0 & 1 & 1\\ 1 & 2 & 3\end{pmatrix}$$

using determinant and inverse of A and check your answer by finding co-factor matrix of A.

(b) Write output of the following command

s = SparseArray[Table[{i+1,2^i} → i^2, {i,3}]

and also give the command which describes positions of non zero elements in s.

(c) Let S = {v1, v2, v3} where v1 = {1, 2, 3}, v2 = {1, –1, 1}, v3 = {4, 5, 9}

Write commands to

(i) Find nullity of the matrix whose columns are given by vectors in S.

(ii) Find whether the vector b = {–1, 2, 5} lies in the span of S.

(d) For the matrix

$$\begin{pmatrix}1 & 0 & 1\\ 0 & 1 & 2\\ 2 & 3 & 1\end{pmatrix}$$

Write commands

(i) To find eigenvalues and eigenvectors.

(ii) To diagonalize the matrix.

UNIT – 2 (R Programming)

4. State whether the following statements are True or False : **(Any ten)** (10)

(a) *seq (2,10,1)* command is used to form a vector 2,3,4,5,6,7,8,9,10.

(b) The command *length(frame)* gives the number of items in the data frame.

(c) The apply() command enables you to apply a function to columns only of a matrix or data frame.

(d) The command hist() is used for recalling all previous commands.