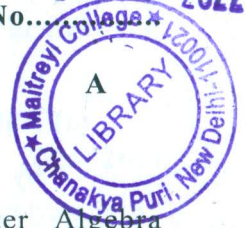


Lib- 13/05/22 (M)

[This question paper contains 8 printed pages.]

Your Roll No...

13 MAY 2022



Sr. No. of Question Paper : 1075

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 $\text{ArcTan}[\frac{1}{4}]$ is _____
- (e) The command for $7 \bmod 3$ 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.

(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 $[0, \pi/3]$ and write the commands for the same.

(b) Write command for sketching the curve :

$$x = 1 + \sin(t)$$

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

(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 :

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

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 $S = \{v_1, v_2, v_3\}$ where $v_1 = \{1, 2, 3\}$,
 $v_2 = \{1, -1, 1\}$, $v_3 = \{4, 5, 9\}$

Write commands to

- Find nullity of the matrix whose columns are given by vectors in S.
- 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

- To find eigenvalues and eigenvectors.
- To diagonalize the matrix.

UNIT - 2 (R Programming)

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

- `seq(2, 10, 1)` command is used to form a vector 2, 3, 4, 5, 6, 7, 8, 9, 10.
- The command `length(frame)` gives the number of items in the data frame.
- The `apply()` command enables you to apply a function to columns only of a matrix or data frame.
- The command `hist()` is used for recalling all previous commands.

- (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 :

$$(4.5 \times 2 = 9)$$

- (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

- (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 :

$$(4.5 \times 2 = 9)$$

- (a) Write commands to evaluate

- (i) product of square roots of 30 and 50.
- (ii) sum of 3^{rd} and 5^{th} 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.