9/5/19

[This question paper contains 8 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **2496-A** **IC**

Unique Paper Code : 32353401

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

Name of the Paper : Computer Algebra Systems and related Softwares

Semester : IV

Time : 2 Hours ***Maximum Marks : 38***

Instructions for Candidates :

(a) Write your Roll No. on the top immediately on receipt of this question paper.

(b) This question paper has **six** questions in all.

(c) **All** questions are compulsory.

Unit - 1 (CAS)

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

P.T.O.

1. Fill in the blanks : 1×5=5

(a) ..... command is used to find the product of two matrices m, n.

(b) The function..... is used to find the n^{th} prime.

(c) ..... command is used to find the value of exponential constant up to 20 digits.

(d) The symbol ..... is used as delayed operator.

(e) ..... command is used to find the transpose of a matrix.

2. Attempt any **six** parts from the following : 1.5×6

(a) Write the command to evaluate the expression $2x^2+x=1$.

(b) Write the command to plot the functions Sin(x) and Cos(x) in the range $-10<x<10$.

(c) Write the command to evaluate (i) $7^{22} \bmod 23$ (ii) $\log_{10}(5.65)$.

(d) Write the command to create a 6×6 sparse matrix with non-zero entries :

(1,2) = 3; (4,3) = 3; (4,5) = 7; (6,1) = 4

(e) Write the command to evaluate $\int_{1/4}^{1/2} \frac{1}{x^2} dx$.

(f) Write the command to evaluate $\sum_{i=1}^{n-1} \left(\frac{1+2i}{n} \right)^2$.

(g) Write the command to create the matrix

$$A = \begin{bmatrix} 7 & -1 & 4 & 3 \\ -1 & 3 & -2 & 5 \\ 0 & 8 & 0 & 7 \end{bmatrix}.$$

Further, write the commands to obtain its second column and the determinant.

(h) Write the command to obtain a 2×4 matrix with random entries within the range of 2 to 10.

3. Attempt any **two** parts from the following : 4×2

(a) For the matrix,

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 4 & -1 \\ 2 & 5 & 3 \end{bmatrix},$$

write commands for :

(i) diagonalization of the given matrix.

(ii) finding its inverse.

(b) Write the command to print first 10 prime numbers.

(c) Write a program to find the gcd of two integers a and b using Euclidean Algorithm and hence find the gcd of 120 and 75.

Unit-II (Software R)

4. Write **True** or **false** for the following : 1×4

(a) The data object combining text and numbers is of type 'text'.

(b) If 'name' is a 10 items vector then name[2:7] shows its second and seventh item.

(c) The length of the following vector is 5 :
days = {2, 4, 5, 5, 4, NA} .

(d) plotpie command is used to draw a pie chart.

5. Attempt any **four** parts from the following : 1.5×4

(a) (i)Write command to read data from the file "hybrid .csv".

(ii) Using scan function, enter the following data :
Subject = {Eng, Sociology, Science, History}.

(b) For a 3 × 3 matrix

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 7 & 1 & 4 \\ 8 & 3 & 5 \end{bmatrix},$$

write the command to give column and row headings.

(c) For the list, m={5, 8, 3, 8, 7, 2} , write the output for the following :

(i) order(m), (ii) rank(m).

(d) Write the command to convert the following data in integers :
M= {3.5, 1.2, 4.3, 7.1, 8.7}.

(e) For the following data vectors

Length={7, 8, 9, 11.5},

Height={4, 9.5, 3.9, 2.5};

write the command to construct the dataframe 'dimension'.

(f) For the following data object 'fw'

abund	flow
1	7
25	12
15	8
12	19
7	14

write the command to view the first four entries of column 'flow'.

6. Attempt any **two** parts from the following : 3×2

(a) For the vector, Data_mp ={ 3, 2, 1, 5, 5, 3, 5, 8, 7, 6, 9, 1, 9, 5, 8}; write the command to :

(i) find the cumulative sum.

(ii) find the 20%,50%,40% quantiles.

(iii) create the stem and leaf plot for the above vector.

(b) For the following two dimensional data,

data 1	data 2	data 3
23	25	34
23	45	12
21	32	21
21	47	43

write the command to :

(i) display the first and third rows.

(ii) determine the structure of the data object.

(iii) For the above data, draw a bar chart with appropriate labels.

(c) Write the commands in R for the following :

(i) Put the following values into a variable d :

3, 5, 7, 3, 2, 6, 8, 5, 6, 9, 4, 5, 7, 3, 4.

(ii) Find mean of d.

(iii) Find the largest value in d.

(iv) Find variance of d.