(*ii*) Let $f(x) = \dfrac{x^3 \cos(x)}{x^2+1}$. Write the commands in Maple to find $f'(x)$, $f''(x)$, $f'(-1)$ and $f''(0)$.

(*iii*) Explain the following commands in Mathematica with example :

(*a*) For loop

(*b*) Do loop

(*c*) Print

(*d*) Module

(*iv*) Write a program to solve the following system of equations in MATLAB/Octave :

$$3u + v - t = 10$$
$$u + 4v - 7w + 2t = 15$$
$$-v + w - 6t = -4$$
$$7u - 2v + w + t = 8$$

(*v*) Write the commands in R for the following :

(*a*) Put the following values into a variable 'score'

30 45 63 72 21
21 45 22 88 61
10 36 20 46 55
21 11 07 54 19

(*b*) Create a box plot of score.

(*c*) Create a stem and leaf plot of score.

(*d*) Create a normal probability plot of score.

8/5/2018 morning (Tuesday)

This question paper contains **4** printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **6841**

Unique Paper Code : **32353401/42353404 HC**

Name of the Paper : **Computer Algebra Systems and Related Softwares**

Name of the Course : **B.Sc. (H) Mathematics/B.Sc. Math Sc./ B.Sc. (Prog.)**

Semester : **IV**

Duration : **2 Hours** Maximum Marks : **50**

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

This question paper has *four* questions in all.

All questions are compulsory.

1. Fill in the blanks : 5×1=5

(*i*) The rank of a matrix A in MATLAB is given by the command.....

(*ii*) In R, the.....function produces stem and leaf plot of an array.

(*iii*) The command for $\log_{10} 5$ in Mathematics is.....

(*iv*) .....is the command to write the matrix $\begin{bmatrix} 2 & 3 \\ 7 & 1 \end{bmatrix}$ in Maxima.

(*v*) The built-in constant *e* is represented by.....in Maple.

2. Write the output for the following : 5×1=5

(*i*) $i = 1;$

While [$i <= 10$, $i = i + 1$; Print[i]; $i + +$]

(*ii*) A = {{1, 0, 2}, {2, 3, 0}, {1, 2, 1}};

A^2

(*iii*) prod(sqrt(*i*), *i*, 1, 4);

(*iv*) $f(x)$: = x^3 + sin (x);

diff ($f(x)$, x);

(*v*) A = [1, 2, 3; 4, 5, 6; 7, 8, 9];

A(2, :) + A(3, :)

3. Attempt any EIGHT parts from the following : 8×2=16

(*i*) Define *mesh*() function in MATLAB/Octave with an example.

(*ii*) Write the commands for the following in Maple :

(*a*) Binomial coefficient $\binom{7}{2}$

(*b*) Prime factorization of 654382

(*iii*) Define and differentiate a function $f(x) = x^4 + 3 \sin x - 2$ in Maple.

(*iv*) Write a command in Maxima to plot the graph of the function $h(x, y) = x^4y + \cos(x, y)$, for $1 \leq x, y \leq 2$.

(*v*) Write any *two* differences between Mathematica and Maxima.

(*vi*) Write the commands for the following in Maxima :

(*a*) $\sin\left(\frac{\pi}{2}\right) + \cos\left(\frac{3\pi}{2}\right)$

(*b*) Previous prime number of 2008

(*vii*) Define *pnorm*() and *qnorm*() functions in R. If *pnorm* (–1.645) = 0.04998491 then what is the value of *qnorm*(0.04998491) ?

(*viii*) Write a command in MATLAB/Octave to find :

(*a*) Eigenvalues and eigenvectors of a matrix A.

(*b*) Lower and upper triangular parts of matrix A with a permutation matrix P.

(*ix*) For A = [2, 0, 3; 5, 8, –1; 6, 7, 1]; write the output for the following :

(*a*) A([1, 3], [2, 1])

(*b*) A([1, 2], :) = A([2, 1], :)

(*x*) Write commands in R to simulate a random sample of 15 items from a normally distributed data that has mean 30 and standard deviation 9.

4. Attempt any *four* parts from the following : 4×6=24

(*i*) Write the commands in Maxima for the following :

(*a*) Find M^2 for $M = \begin{bmatrix} 1 & 3 \\ 4 & 0 \end{bmatrix}$.

(*b*) Find x if $x^2 + x = 1$.

(*c*) Compute $7^{20} mod\ 21$.

(*d*) Find prime factorization of 281.

P.T.O.