Name of Course	: **CBCS(LOCF) B.A. (Prog.)**
Unique Paper Code	: **62353327**
Name of Paper	: **SEC – Computer Algebra System**
Semester	: **III**
Duration	: **3 hours**
Maximum Marks	: **38 Marks**

Attempt any four questions. All questions carry equal marks.

Using any one of the CAS - Mathematica/Maple/Matlab/Maxima/any other

1. Write the command to show graphically the intersecting points of the circle $x^2 + y^2 = 9$ and the parabola $(y-2)^2 = x + 4$.

2. Write the command to sketch the graphs of $f(x) = x, g(x) = x^2$ combined in a single graph on the domain $-2 \le x \le 2$.

Write the command to sketch the plot of piecewise function $f(x) = \begin{cases} 2x+3, & x \le 4 \\ 7 + \frac{16}{x}, & x > 4 \end{cases}$.

3. For the $f(x) = x^4 - 10x^3 + 2x^2 + 8x - 5$ write a command to find a
(i) root of $f(x) = 0$, (ii) factor of $f(x)$.

4. How do you find a differentiation of a function in any CAS? Write code for defining a function $f(x) = 10 - (3-x)^2$ and finding its derivative.

How do you find maxima and minima in any CAS? Write code for defining a function $f(x) = x^3 - 3x + 1$ and finding its maxima and minima.

5. Write the syntax to define a vector $v = (2, 5, 7, 1, 2, 0, 7, 9, 11)$ and to obtain the following
(i) sort the vector *v* in ascending order,
(ii) extract the sixth element from vector *v*.

Maximize the function $2x + y$ subject to the constraints $3x + 5y \le 15$ and $6x + 2y \le 24$.

6. Generate a square matrix of order 5 with the elements $a_{ij} = 7i + 2j$, with $i, j =$ 1,2,3,4,5. Find its eigenvalues with the help of its characteristic polynomial. Also find eigenvectors corresponding to each eigenvalue.

Write the syntax to obtain a square matrix of order 10 with 0 as the diagonal elements, 2 below the diagonal and 1 above the diagonal. Is the matrix singular? Give reason for the same.