2024

MATHEMATICS

Paper Code: SEC0316303

(Computer Algebra System And Related Software)

Full Marks : 30

Time : 2 hours

The figures in the margin indicate full marks for the questions

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1. Answer the following: [1 × 4 = 4]

   (a) In Mathematica as a calculator which key is used to evaluate an expression.

   (b) We may want to use the same variables later in a different context in Maple which command is used disappear the value of these variables.

   (c) Which function is used to request the numerical value of an expression in maxima.

   (d) Which special variable is used to work with the output of the previous command in mathematica.

2. Answer **any six** of the following: [2 × 6 = 12]

   (a) Is Mathematica case sensitive? Justify your answer.

   (b) What is the use of Mathematica "notebook".

   (c) Write the command in maxima to calculate the number π to 8 decimal places.

   (d) Write the command to find the minors and cofactor for the matrix A = $\begin{bmatrix} 1 & 5 & -4 & 1 & 1 \\ 3 & 4 & -1 & 2 & 2 \\ 3 & 2 & 1 & 5 & 3 \\ 0 & -6 & 7 & 1 & 4 \\ 5 & -8 & 0 & 1 & 3 \end{bmatrix}$

   (e) Write the command for built-in constants π, iota in mathematica and maxima.

   (f) Write the command in maxima to draw a graph of the surface $z = e^{-(x^2+y^2)}$, for $-2 \leq x, y \leq 2$.

   (g) Write the command in any one of the CAS to plot the graph of $\frac{(x-3)(x-4)}{(x-2)(x-5)}$ for $0 \leq x \leq 7$

   (h) Create a Manipulate showing a Plot of the sine function, with a PlotLabel that indicates the value of the function for any value of x between $-\pi$ and π. The user can control x with a slider.

   (i) Use the Axes, Frame, Filling, FrameStyle, PlotRange, and AspectRatio options to produce the following plot of the function $y = \frac{cos(15x)}{1-x^2}$ in mathematica.

3. Answer **any two** of the following: [3 × 2 = 6]

   (a) Using the seq() function and the ithprime() function write the command to construct a list of the first 20 prime numbers in Maple.

   (b) Mention atleast two similarities and dis- similarities between Mathematica and Maple.

   (c) Write the command in Mathematica to draw a graph of three lines, y = 4x + 1, y = -x + 4, and y = 9x - 8, for $0 \leq x \leq 2$.

   (d) Explain the three popular computer algebra systems.

4. Answer **any two** of the following: [4 × 2 = 8]

   (a) Write the output of the following -

   i. Prime factorization of 60466176 in maple.

   ii. The value if $\sum_{i=1}^{n} i^2$ in Maxima.

   iii. Square root of 362404 in mathematica

   iv. Value of 17^4 in mathematica.

(b) Write the command in mathematica to plot the following functions on the domain -10 $\leq$ x $\leq$ 10.
i. $sin(1 + cos(x))$
ii. $sin(1.4 + cos(x))$
iii. $sin(\frac{\pi}{2} + cos(x))$
iv. $sin(2 + cos(x))$.

(c) Define two matrix in mathematica. Write down the command to find the sum, product, trace and order of the resultant matrix, and the inverse of "the product of two matrix". Also mention the output.

(d) Write the command in mathematica to solve the system of non homogeneous linear equations by Gaussian elimination method
x + 2y - 3z =4
2x- y + 5z = 2
4x + 3y + 4z =2

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