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(Sem-3) SEC

**2024**

**PHYSICS**

Paper Code : SEC0301403

( PROGRAMMING IN MATHEMATICA )

Full Marks : 30

Time :  $1\frac{1}{2}$  hours



*The figures in the margin indicate  
full marks for the questions.*

1. State True or False for the following

1 x 5= 5

- a) Mathematica can only perform numerical calculations and cannot handle symbolic computations.
- b) The Plot3D function in Mathematica is used to visualize functions of two variables in a three dimensional space.
- c) In Mathematica, parametric curves can be plotted using the ContourPlot function.
- d) You can customize plots in Mathematica by changing their colors, thickness, and adding titles using options like PlotStyle and PlotLabel.
- e) Mathematica's Piecewise function allows you to define functions with different expressions for different parts of their domain.

Contd.

2. Define the following with examples (any five)

2 x 5 = 10

- a. Gauss Elimination
- b. Minors
- c. Transpose of matrix
- d. Determinant of matrix
- e. Inverse of matrix
- f. Eigenvalue of matrix
- g. Cofactors
- h. Eigenvector of matrix
- i. Rank of Matrix
- j. Nullity of Matrix



3. Write any three program from the below

5 x 3 = 15

- a) What is Basic arithmetic operations and order of operations?  
Explain with examples.
- b) Give one example of commands performing following tasks:
  - i. Plotting a sine function from 0 to  $\pi$ .
  - ii. Plotting 3D functions
  - iii. Generate a table of sine values at interval  $\frac{\pi}{4}$ .
  - iv. Animate sine wave with shifting phase.
  - v. Combine the sine and cosine function on the same plot.
- c) What are expressions? Give example of expressions with output.
- d) Define piecewise function. Give suitable examples with explanations?
- e) What is parametric curve and surfaces. Explain with examples.

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