**U.G. 3rd Semester Examination - 2020**

# PHYSICS

**[HONOURS]**
**Course Code : PHY-H-CC-P-05**
**(Mathematical Physics-II)**
**[PRACTICAL]**

Full Marks : 20          Time : 2 Hours

*The figures in the right-hand margin indicate marks.*

Answer any **four** questions:      5×4=20

1. Write a program using Python/ Matlab/ Scilab/ Octave to find the eigenvalues and Eigen vectors of the matrix

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ -1 & 2 & 0 & 5 \\ 0 & 4 & -2 & 6 \\ 2 & 4 & 0 & 6 \end{pmatrix}$$

2. Explain how you will solve a system of three linear equations using Gauss Seidel method.

3. How you will find the parameters '$m$' and '$c$' to least square fit a set of experimental data using

$\{(x_1, y_1), (x_2, y_2),... (x_n, y_n)\}$ with a straight line $y = mx+c$.

[Turn over]

4. Write a program to find and plot Legendre polynomials of degree 1 to 5 using Matlab/ Scilab / Matplotlib.

5. Write a program in Python/ Matlab/ Scilab/Octave to solve the following differential equation using modified Euler equation

$$\frac{dT}{dt}=\alpha(T-T_0)$$

Where $\alpha=0.4$ and $T_0=273K$ with the initial condition $T(t=0)=373K$.

6. Write an algorithm to solve the equation for the current in LC circuit with DC source using Euler method.

7. The following data is obtained for the flow of current through a simple resistive circuit

| V (in Volts) | 0 | 5 | 10 | 15 | 20 | 25 |
|---|---|---|---|---|---|---|
| I (in A) | 0 | 0.51 | 1.03 | 1.49 | 2.01 | 2.53 |

Write a program in Python/ Matlab/ Scilab/Octave to find the resistance of the circuit using least square fit.

8. Write an algorithm to solve equation of damped harmonic oscillations by the method of Runge Kutta second order method.

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