2018

CBCS

3rd Semester

PHYSICS

PAPER—C5P

(Honours)

(Practical)

Full Marks : 20

Time : 2 Hours

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

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Mathematical Physics–II Lab.

(i) Write the necessary formula.

(ii) Write the *computer code* PYTHON only.

(iii) Print the input and output.

(iv) Display your result graphically.

Answer any *one* of the following :

1. (a) Write a Python program to find the Inverse of the following matrix. 7

$$A = \begin{pmatrix} 3,5,8 \\ 4,6,9 \\ 8,6,4 \end{pmatrix}$$

(b) Write a Python program to solve the differential equation for radioactive decay using Euler method and plot it using Matplotlib module. 8

2. (a) Write a program to compute the value of R from the five set of data of Ohm's law experiment. 7

V(Volt)	I(mA)
2.1	5.12
3.2	7.80
3.8	9.26
4.5	10.90
4.8	11.70

(b) Write a computer program to solve the differential equation for finding the time variation charge during Charging of a capacitor with DC source using Euler and plot it using Matplotlib module. 8

3. (a) Write a computer program to generate an ellipse and plot it using matplotlib module. 7

(b) Write a computer program to solve the differential equation for finding the current in LC circuit connected with DC source using RK2 method and plot it using Matplotlib module. 8

4. (a) Write a computer program to find the Transpose of the following matrix. 7

$$A = \begin{pmatrix} 2,5,12,8 \\ 3,6,9,13 \\ 8,6,4,10 \end{pmatrix}$$

(b) The temperature of a well stirred liquid by the isothermal heating coil is given by the equation :

$\frac{d\theta}{dt} = K(100 - \theta)$, where K is a constant of the system.

Write a computer program to solve the equation by Runge-Kutta 2nd order method to find q at t = 2.0 sec for K = 2.5. Initial condition : $\theta = 90°C$ at t = 0 sec. 8

5. (a) Write a computer program to generate a parabola and plot it using matplotlib module. 7

(b) Write a computer program to solve the differential equation for finding the time variation charge during discharging of a capacitor with DC source using Euler method and plot it using Matplotlib module. 8

6. (a) Write a program to find the solution of three given linear system equations. 7

$$3X_1 + 2X_2 + 4X_3 = 7$$

$$2X_1 + X_2 + X_3 = 4$$

$$X_1 + 3X_2 + 5X_3 = 2$$

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(b) Write a computer program to find the solution of a damped harmonic oscillator using Euler method, given b = 0.1 and $\omega_0 = 1$ plot it using matplotlib module. 8

7. (a) Write a program to find the solution of three mesh equations of electrical circuit. 7

$$50\ I_1 - 30I_3 = 80$$

$$40\ I_2 - 20\ I_3 = 80$$

$$100\ I_3 - 20I_2 - 30I_1 = 0$$

(b) Write a computer program to find the solution of a simple harmonic oscillator (no friction) using RK2 method, given k = 1 and plot it using matplotlib module. 8

8. Solve the ODE problem

$$\frac{dT}{dt} = -\frac{1}{27}(T - 65),\ T(0) = 200°F$$

Using the Euler method in the range [0.0, 10.0] with step 1.0. Plot the numerical solution together with the exact solution $T(t) = 65 + 135e^{-t}/27$. 2·7½

9. An experiment of spring constant determination is performed and obtained the following information :

Mass(gm)	50	100	150	200	250
Displacement(cm)	2	4	6	8	11

Fit a straight line $w = kx$ (Hooke's law formula) and plot your fitted graph on the curve with the data.

10. An electric circuit with a resistor, a capacitor, an inductor and a voltage source can be described by the ODE

$$L\frac{dI}{dt} + RI + \frac{\theta}{c} = E(t), \frac{d\theta}{dt} = I$$

Use the Euler method to solve these two ODE for time step $\frac{2\pi}{60w}$. Where L = 1 H, E(t) = 2 sin (wt) V, w^2 = 3.5 s^{-2}, c = 0.25C, R = 0.02Ω, I(O) = 1A and Q(O) = 1C.

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11. Laboratory Note Book	2
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