[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1594 **C** **Roll No.....**

Unique Paper Code : 222404

Name of the Paper : Numerical Analysis Lab. (PHHP–414)

Name of the Course : B.Sc. (Hons.) PHYSICS, Part II

Semester : IV

Duration : 1 Hour

Maximum Marks : 20

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **twenty** questions in all.
3. The symbols used in the question paper have their usual meanings.
4. Non-programmable scientific calculators are allowed.
5. Each question carries **one** mark.

1. Define the term *relative error.*
2. What are *truncation errors* ?
3. What are *algebraic equations* ? Give one example.
4. What do you mean by the *root* of an equation ?
5. What are *Direct Methods* for solving an equation ?

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6. Write the formula of *secant method* for solving algebraic and transcendental equations.

7. Solve the following system of equations by Gaussian elimination method :

$$2x + y = 7$$

$$3x + 2y = 12$$

8. Why is the *Gauss-Seidel Method,* used for solving system of linear equations, called *the method of successive displacements* ?

9. Using iterative method find the dominant eigenvalue and the corresponding eigenvector of the following matrix. Do **two** iterations.

$$A = \begin{bmatrix} 1 & 2 \\ 1 & 7 \end{bmatrix}$$

10. Define *Second Order Backward Differences.*

11. Form a *Forward Difference Table* from the following set of values :

x	1	2	3	4	5
y	1.2	3.8	8.6	15.7	24.5

12. Derive the relation : $E^{-1} = 1 - V$

13. Write *Newton's Forward Difference Interpolation Formula.*

14. Define *First and Second Order Divided Differences.*

15. What is *least square method* for fitting a straight line to a given set of data points ?

16. Define *orthogonal polynomials*.

17. What is a *Cubic Spline* ?

18. Give the formula for *First Derivative* based on *Newton's Backward Difference Interpolation Formula*.

19. Evaluate the following integral by *Trapezoidal Rule* (Take $h = 0.5$)

$$I = \int_0^1 x \, dx$$

20. Evaluate the following integral by *Simpson's 1/3 Rule* (Take $h = 1.0$)

$$I = \int_0^2 x^2 \, dx$$

21. Evaluate the following integral by *one-point Gauss-Legendre quadrature formula*

$$I = \int_{-1}^{1} (1 + x) \, dx$$

22. Evaluate the following integral by *one-point Gauss-Hermite quadrature formula*

$$I = \int_{-\infty}^{\infty} e^{-x^2} \, dx$$

23. What is an *Initial Value Problem* ?

24. Write the expression of *Euler's method* for solving First Order Ordinary Differential Equations ?

25. Give the formulae of *Second Order Runge-Kutta method.*