School of Basic Sciences
Master of Science in Physics
Mid Term Examination - May 2024

Duration : 90 Minutes
Max Marks : 50

Sem II - C1PO207B - Applied Numerical Methods

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1) How is the Gauss-Jordan method different from the Gauss-Seidel Method? 　　K2 (2)

2) How fast does Newton Raphson method converge? 　　K1 (3)

3) What do you understand about the time complexity of a numerical algorithm? 　　K2 (4)

4) Suppose the function $f(x) = x^2 - 4x + 3$ has a root at $x = 3$. Apply the Newton-Raphson method to find an approximate root starting from $x_0 = 2$. Determine the value of x_1 after one iteration. 　　K2 (6)

5) Using Jordan Method, find the eigenvalues and eigenvectors of the matrix 　　K3 (6)

$$A = \begin{pmatrix} 5 & 2 \\ 2 & 5 \end{pmatrix}$$

6) Use the Gauss-Seidel method to find the solution: 　　K3 (9)

$$2x + 3y = 11$$
$$4x - y = 9$$

7) Use the Birge-Vieta method to find the roots of the polynomial $f(x) = x^4 - 5x^3 + 7x^2 - 3x + 1$. Begin with an initial guess of $x_0 = 0.5$. Compute the roots with an error tolerance of 10^{-4}. 　　K4 (8)

8)

Apply Gauss elimination method to find the solution of the system of equations: K4 (12)

$$x + 2y + 3z = 14$$
$$2x + 3y + 2z = 19$$
$$3x + y - z = 4$$

OR

Solve the following system of linear equations using Gauss elimination method: K4 (12)

$$2x + 3y - z = 1$$
$$x - 2y + 2z = -2$$
$$3x + y - 3z = 4$$