

**S<sub>4</sub> (UCE04B03), CE**

**B. Tech 4<sup>th</sup> Semester Midterm Examination 2021**  
**Data Structures and Numerical Methods**  
**UCE04B03**

**Full Marks: 30**

**Time: 1.0 Hours**

The figures in the margin indicate full marks for the questions

**Section-A (Answer all the questions)**

- 1) Define truncation error with an example.
- 2) Define rounding-off error with an example.
- 3) Write the number of significant digits of 0.0025.
- 4) Write the condition to ensure convergence of Gauss-Seidel method of solving a system of linear algebraic equations.
- 5) What is the order of the rate of convergence in the Newton-Raphson's method of solving nonlinear equations?
- 6) What is the advantage of the Sectant method over the Newton-Raphson's method of solving nonlinear equations?

6x1=6

**Section-B (Answer any four questions)**

- 1) Write a computer program that reverses a number with two digits.
- 2) Write a computer program that obtains factorial of any given integer.
- 3) Write the normal equations for fitting a quadratic function to given data points.
- 4) For the following set of equations:  $5x_1 + x_2 + 2x_3 = 8$ ,  $3x_1 + 2x_2 - x_3 = 4$  and  $x_1 + 3x_2 + 5x_3 = 10$  apply forward elimination of the Gauss Elimination method to convert the coefficient matrix to an upper-triangular matrix.
- 5) Apply Bisection method to obtain a root of the equation  $f(x) = x^3 - 3$  between the points 1 and 2. Show two iterations.

3x4=12

**Section-C (Answer any two questions)**

- 1) Write a computer program that asks the user to enter two vectors of size  $n \times 1$  and gives the dot product of these two vectors as output.
- 2) Write a computer program that asks the user to enter a matrix of size  $m \times n$  and gives the transpose of that matrix as output.
- 3) For the equation  $f(x) = 2x^3 - 2.5x - 5$ , find out a root near the point  $x=2$  by using the Newton-Raphson's method. Show three iterations.

6x2=12