

Dr. Babasaheb Ambedkar Open University
Term End Examination July – 2026

Course	: BSCIT	Date	: 23/07/2026
Subject Code	: BSCIT-403	Time	: 03:00pm to 05:15pm
Subject Name	: Computer Oriented Numerical Methods	Duration	: 02.15 Hours
		Max. Marks	: 70

Section A

Answer the following (Attempt any three) 30

1. Explain normalized floating-point representation. Describe the causes of overflow and underflow during addition and subtraction operations with examples.
2. Explain the Bisection method for finding roots of non-linear equations. Write down its algorithmic steps and find a root of the equation $f(x)=2x^3-2x-5$.
3. Define symmetric, skew-symmetric, and diagonal matrices. Solve the following system of linear equations using the Gauss-Elimination method: $2x + y + z = 5$, $3x + 5y + 2z = 15$, $2x + y + 4z = 8$.
4. Derive Newton's Forward Difference Interpolation Formula and explain how forward difference tables are constructed.
5. Explain the Principle of Least Squares for curve fitting. Find the least squares fit of the form $y = a_0 + a_1x^2$ to the following data.

x	-1	0	1	2
y	2	5	7	1

Section B

Answer the following (Attempt any four) 20

1. Differentiate between absolute errors and relative errors. Let $x = 0.00573735$; find the absolute error if x is truncated to three decimal places.
2. Explain the Gauss-Jordan method for solving simultaneous linear equations and state how it differs from the standard Gauss-Elimination method.
3. What is spline interpolation? Discuss Natural Splines and Cubic Runout Splines briefly.
4. Discuss the method of Fitting a Non-Linear Function with Geometric Curve.
5. Explain Trapezoidal Rule for numerical integration and state its geometric significance.
6. Explain Euler's method for finding the numerical solution of a first-order ordinary differential equation.

Section C

Part – A (Multiple Choice Questions) 10

1. A floating-point number is said to be normalized if the first digit of the mantissa is always:
A. 0 B. 1
C. 2 D. Any non-zero digit
2. The error caused by discarding or chopping off digits in floating-point representation is known as:
A. Round-off error B. Truncation error
C. Absolute error D. Relative error
3. The Bisection method is also known as:
A. Regula-Falsi method B. Bolzano method
C. Secant method D. Newton's method
4. For a square matrix A , if $a_{xy} = -a_{yx}$ and all diagonal entries are zero, the matrix is called:
A. Symmetric Matrix B. Diagonal Matrix
C. Skew-Symmetric Matrix D. Identity Matrix

5. The sum of all diagonal elements in a square matrix is called the:
 - A. Determinant
 - B. Trace
 - C. Rank
 - D. Adjoint
6. Which interpolation formula is preferred when finding a value near the beginning of a tabulated dataset with equal intervals?
 - A. Newton's Backward Formula
 - B. Newton's Forward Formula
 - C. Lagrange's Formula
 - D. Stirling's Formula
7. In the method of least squares, the best-fit line minimizes the sum of:
 - A. Absolute deviations
 - B. Squares of residuals (deviations)
 - C. Direct errors
 - D. Relative errors
8. Simpson's 1/3rd Rule for numerical integration requires the total number of sub-intervals (n) to be:
 - A. An odd number
 - B. A multiple of 3
 - C. An even number
 - D. Any prime number
9. Which of the following numerical integration rules is derived by putting $n = 3$ in the Newton-Cotes formula?
 - A. Trapezoidal Rule
 - B. Simpson's 1/3rd Rule
 - C. Simpson's 3/8th Rule
 - D. Weddle's Rule
10. Euler's method for solving ordinary differential equations develops a piecewise approximation based on:
 - A. Curvature
 - B. Tangent slope (linear extrapolation)
 - C. Higher-order derivatives
 - D. Spline fitting

Part - B (Do as Directed)

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1. Which number representation consists of three parts: sign, mantissa, and exponent?
2. Absolute Error is defined as the magnitude of the difference between the actual value and the approximate value. (True/False)
3. The False Position method is also known as the method of _____.
4. The inverse of a matrix A exists only if matrix A is square and _____.
5. Which is an iterative method for solving simultaneous linear equations?
6. _____ can be used for both equally and unequally spaced intervals.
7. In curve fitting, linear regression involves fitting a straight line of the form $y = a + b_x$. (True/False)
8. What is Identity Matrix?
9. Numerical differentiation formulas generally tend to amplify errors compared to numerical integration formulas. (True/False).
10. Runge-Kutta methods are three-step methods used for solving ordinary differential equations. (True/False)

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