

Tribhuvan University  
Institute of Science and Technology  
2077

Bachelor Level / third-semester / Science Full marks: 60 **Computer Science and Information Technology(CSC207)** Pass marks: 24  
(Numerical Method) Time: 3 hours Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.

**Group A**

Attempt any Two questions:(10 x 2 = 20)

1. Derive the formula for Newton Raphson Method. Solve the equation  $x^2 + 4x - 9 = 0$  using Newton Raphson method. Assume error precision is 0.01. Discuss drawbacks of the Newton Raphson method.
2. How does interpolation differ from regression? Write down algorithm and program for Lagrange interpolation.
3. Why is partial pivoting used with the Naive Gauss Elimination method? Solve the following system of equations using Gauss Elimination method with partial pivoting? How does the Gauss Jordan method differ from the Gauss elimination method?

$$2x + 2y - z = 6$$

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

$$x + y + z = 0$$

**Group B**

Attempt any eight questions:(5 x 8 = 40)

4. Define the terms true error and relative error? Use Horner' method to evaluate polynomials  $2x^3 - 3x^2 + 5x - 2$  at  $x = 3$  and write down its algorithm.
5. Construct Newton's forward difference table for the given data points and approximate the value of  $f(x)$  at  $x = 15$ .

x	10	20	30	40	50
F(x)	0.173	0.342	0.5	0.643	0.766

6. Fit the curve  $y = ae^{bx}$  through the following data points.

x	1	2	3	4
y	1.65	2.70	4.50	7.35

7. Discuss the Doolittle LU decomposition method for matrix factorization.
8. Write down an algorithm and program for the differentiating continuous function using a three point formula.
9. How does Simpson's 1/3 rule differ from the trapezoidal rule? Derive the formula for Simpson's 1/3 rule.
10. Appropriate the solution of  $y' = 2x + y$ ,  $y(0) = 1$  using Euler's method with step size 0.1. Approximate the value of  $y(0.4)$ .
11. A plate of dimension 18cm x 18cm is subjected to temperatures as follows: left side at  $100^{\circ}\text{C}$ , right side at  $200^{\circ}\text{C}$ . Upper part at  $50^{\circ}\text{C}$ , and lower at  $150^{\circ}\text{C}$ . If a square grid length of 6cm x 6cm is assumed, what will be the temperature at the interior nodes?
12. How boundary value problems differ from initial value problems? Discuss shooting methods for solving boundary value problems.