

Tribhuvan University  
Institute of Science and Technology  
2081  
☆

Bachelor Level / Second Year/ Third Semester/ Science  
**Computer Science and Information Technology (CSC 207)**  
(Numerical Method)  
**(OLD COURSE)**

Full Marks: 60  
Pass Marks: 24  
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.

**Section A**

**Attempt any TWO questions:**

(2×10=20)

1. What are the different types of errors? Write an algorithm and a C-Program to obtain the roots of non-linear equation using Newton Raphson method. (2+8)
2. Define ordinary differential equation. Why numerical differential equation is required? Derive Newton forward difference formula with suitable diagram. (2+1+7)
3. Solve the following ordinary differential equation using shooting method. (10)  
 $y'' + xy' - xy = 2x$ , with boundary conditions  $y(0) = 1$ ; and  $y(2) = 9$

**Section B**

**Attempt any EIGHT questions:**

(8×5=40)

4. How would you choose two initial values that are required for Bisection method? Use Bisection method to estimate the root of the equation  $\log x - \cos x = 0$ . (1+4)
5. Solve the following equations using Gauss Elimination Method with partial pivoting. (5)  
 $x + 2y + 3z = 5$   
 $2x + 8y + 22z = 6$   
 $3x + 22y + 82z = -10$
6. Fit a second order polynomial to the data in the table below: (5)

$X$	1	2	3	4	5
$F(x)$	2	6	12	20	30

7. Estimate  $f(3)$  from the following data using cubic spline interpolation. (5)

$X$	1	2.5	4	5.7
$F(x)$	-2.0	4.2	14.4	31.2

8. Use Gauss Legendre three-point formula to evaluate the integral:  $I = \int_2^4 (x^4 + 4)dx$ . (5)
9. Solve the following differential equation  $\frac{dy}{dx} = 3x + \frac{y}{2}$  with  $y(0) = 1$  for  $x = 0.2$  ( $h = 0.1$ ) using Euler's Method. (5)

10. From the following table find the value of X, correct to 3-decimal places for Which Y is minimum and find this value of Y. (5)

X	0.60	0.65	0.70	0.75
Y	0.6221	0.6155	0.6138	0.6170

11. Find the Eigen values and Eigen vectors of the Matrix: (5)

$$A = \begin{pmatrix} 48 & 8 \\ 6 & 26 \end{pmatrix}$$

12. The steady- state two-dimensional heat flow in a metal plate is defined by:

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$$

A steel plate of size  $30 \times 30$ cm is given. Two adjacent sides are placed at  $100^\circ$  and other side held at  $0^\circ$ . Find the temperature at interior points, assuming the grid size of  $10 \times 10$ cm.