Tribhuvan University Institute of Science and Technology 2081

200

Bachelor Level / Second Year/ Third Semester/ Science

Computer Science and Information Technology (CSC 212)

(Numerical Method)
(NEW COURSE)

Full Marks: 60 Pass Marks: 24 Time: 3 hours.

Candidates are required to give their answers in their own words as for as practicable. The figures in the margin indicate full marks.

Section A

Attempt any TWO questions:

 $(2 \times 10 = 20)$

- 1. What are inherent errors? Derive the Newton Raphson method for solving non-linear equation and using this method solve $x^2-5x+6=0$, calculate upto 3 decimal places. (2+4+4)
- 2. What are the limitations of direct methods for solving a system of linear equations? How Gauss Seidel method differs from Jacobi iteration? Solve the following system of linear equation using Jacobi iteration method.

 (2+3+5)

2x-7y-10z=-17

5x+y+3z=14

x + 10y + 9z = 7

3. Write an algorithm and program to implement Lagrange interpolation method. (5+5)

Section B

Attempt any EIGHT questions:

 $(8 \times 5 = 40)$

Consider the following data points estimate the f(0.6) using Newton's interpolation formula. (5)

 x
 0.1
 0.2
 0.3
 0.4
 0.5

 f(x)
 2.68
 3.04
 3.38
 3.69
 3.97

5. What is regression analysis? Fit a second order polynomial for the following data values. (1+4)

X	2	4	6	8	10	
у	1.4	2.0	2.4	2.6	2.8	

What is numerical differentiation? The table below gives the values of distance travelled by a vehicle at various time interval, estimate the velocity and acceleration at x=4.

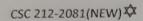
 Time (x)
 1
 2
 4
 8
 10

 Distance (y)
 0
 1
 5
 21
 27

- 7. What is application of numerical integration? Find the value of integration for $\int_{1}^{2} \frac{e^{x}}{x} dx$ using Simpson's 3/8 rule with n=6.
- 8. Solve the following system of linear equations using Gauss-Jordan elimination method. (5)

2x+4y-6z=8

x-2y+5z=4



Given the data points below

X	1.0	3.0	4.0
f(x)	1.5	4.5	9.0

10. What is differential equation? Differentiate between ODE and PDE with example. (2+3)

Solve
$$\frac{dy}{dx} = \frac{x}{y}$$
, y (0) = 1, at x=0.4 using Runge-Kutta's 4th order method. (5)

12. Solve the Poisson equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = -64xy$, $0 \le x \le 1$, $0 \le y \le 1$ with boundary conditions: u(0,y)=0, u(x,0)=0, u(x,y)=150, u(x,1)=150 and h=1/3. (5)