Tribhuvan University
Institute of Science and Technology
2081
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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: (2×10=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: (8×5=40)

4. 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
y	1.4	2.0	2.4	2.6	2.8

6. 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. (1+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. (1+4)

8. Solve the following system of linear equations using Gauss-Jordan elimination method. (5)
   $x+2y-3z=4$
   $2x+4y-6z=8$
   $x-2y+5z=4$

9. Given the data points below

X	1.0	3.0	4.0
f(x)	1.5	4.5	9.0

Find cubic spline which belongs to 1<=x<=3 and estimate f(2) using cubic splines. (5)

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

11. 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, $0 \leq x \leq 1$, $0 \leq y \leq 1$ with boundary conditions: u(0,y)=0, u(x,0)=0, u(1,y)=150, u(x,1)=150 and h=1/3. (5)