CSC 212-2082(NEW) ✡

Exam Roll No.....

Tribhuvan University

Institute of Science and Technology

2082

✡

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. Derive the secant method for solving non-linear equation and using this method solve $3x^3 - x - 5 = 0$, correct up to three decimal places. [5+5]

2. How does pivoting improve accuracy of solution? Explain how Gauss elimination method differs from Gauss Jordan method. Solve the following system of linear equations using Gauss elimination with partial pivoting: [2+3+5]

   $x + 2y - z = 1$
   $3x - y + 2z = 12$
   $2x + y + 2z = 10$

3. What is numerical integration and why is numerical integration used instead of analytical integration? Write an algorithm and a program to compute the integration using Simpson's 1/3 rule. [2+4+4]

Section B

Attempt any EIGHT questions: **(8 × 5 = 40)**

4. Discuss the sources of errors in numerical calculations and explain how each type affects computational results. [5]

5. How regression differ from interpolation? Construct the cubic spline for the following data points. [1+4]

X	1	2	3
Y	2	3	5

6. A meteorologist is tracking the temperature at different times during the day to predict the temperature at a specific hour. The following temperature data (in °C) was recorded at different hours:

Time (t)(hrs)	5	8	10	13
Temperature (T)(°C)	18	22	24	26

Estimate the temperature at t= 9 using Lagrange's interpolation. [5]

7. A software project manager wants to study the relationship between the number of lines of code (LOC) written and the number of bugs reported during testing. The data from several modules is shown below.

Lines of Code (LOC)	100	150	200	250	300
Bugs Reported	3	6	9	13	17

Fit a straight line to model the relationship between LOC and bugs reported. [5]

8. Some observation records the displacement of a particle at different time intervals to study its motion. The data collected is given below.

Time (t in sec)	2	2.5	3	3.5	4
Displacement(s in m)	3.00	5.10	5.90	6.50	7.40

Construct the divided difference table for the displacement data and estimate the particle's velocity and acceleration at t = 2.5 seconds. [5]

9. Solve the following system of linear equations using the Jacobi iteration method. [5]

$2x+3y-z=1$
$4x-y+2z=2$
$-3x+2y+3z=3$

10. Explain how boundary value problem differs from initial value problem. Explain how shooting method is used to solve boundary value problem. [2+3]

11. Find the approximate value of y when x=0.4 for the differential equation $dy/dx=x^2+y$, given that y=2 when x=0, using the Runge-Kutta method of order 4 with a step size of h=0.2. [5]

12. Consider a metallic plate of size 36cm x 36cm. If two of the sides are held at 50 degree celsius and the other two sides at 0 degrees celsius, find the steady state temperatures of interior points, assuming a grid size of 12cm x 12cm. [5]