CSc. 204-2072 ✡

Tribhuvan University
Institute of Science and Technology
2072

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Bachelor Level / Second Year/ Third Semester/ Science
Computer Science and Information Technology (CSc. 204)
(Numerical Method)

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.

Attempt all questions:

1. What are the source of errors? Discuss various types of errors. Find the roots of the equation $x^2 + 5.6x - 14 = 0$ by trial and error method up to 4 significant digits. (1+3+4)

2. Describe Newton's method and its convergence. Find the root of equation $f(x) = e^x - 4x^2 = 0$ using Newton method up to 5 decimal places. (4+4)

3. What do you mean by interpolation and approximation. Use Lagrange interpolation to estimate the value of f(0.6) from the following table of values. (2+6)

x	0.4	0.5	0.7	0.8
f(x)	-0.916	-0.693	-0.357	-0.223

4. Using Newton's divided difference interpolating polynomial estimate the value of f(x) at x = 2.25 for the function defined as

x	0.5	0.2	1.4	2.2	3.0
f(x)	-10.25	-3.768	5.976	28.972	79.0

(8)

5. Write algorithm for Gauss-Seidel method for solving the system of linear equations. Also solve the following system of linear equations using that method. (4+4)

$10x_1 + x_2 + x_3 = 12$
$x_1 + 10x_2 - x_3 = 10$
$x_1 - 2x_2 + 10x_3 = 9$

6. What do you understand by the partial differential equation? Illustrate it with practical example and derive difference equation. (8)

OR

Find the solution of following differential equations using Taylor's series method.
$y' = (x^3 + xy^2)e^{(-x)}$, $y(0) = 1$, to find y at $x = 0.1, 0.2, 0.3$.

7. Write an algorithm and program for computer to obtain the solution of differential equation using Runge-Kutta Method. (5+7)

B.Sc.CSc.204-2073 ✡

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Bachelor Level / Second Year/ Third Semester/ Science
Computer Science and Information Technology (CSc. 204)
(Numerical Methods)

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.
Assume suitable data if necessary.

Attempt all questions:

1. Explain the idea of the secant method to estimate the root of any equation. Using the secant method, estimate the root of the equation

$$x^2 - 4x - 10 = 0$$

with the initial estimates of $x_1 = 4$ and $x_2 = 2$. Do these points bracket a root? (3+4+1)

2. Given the data

x	1.2	1.3	1.4	1.5
f(x)	1.063	1.091	1.119	1.145

Calculate f(1.35) using Newton's interpolating polynomial of order 1 through 3. Choose base points to attain good accuracy. Comment on the accuracy of results on the order of polynomial. (5+3)

3. How do you find the derivative if the function values are given in a tabulated form? The distance traveled by a vehicle at the intervals of 2 minutes are given as follows. Evaluate the velocity and the acceleration of the

Time(sec)	0	2	4	6	8	10	12	14	16
Distance (km)	0	0.25	1	2.2	4	6.5	8.5	11	13

Vehicle at time T = 5, 10, 13. (3+5)

4. What do you mean by ill-conditioned systems? Solve the following system using Dolittle LU decomposition method.

$$3x_1 + 2x_2 + x_3 = 10$$
$$2x_1 + 3x_2 + 2x_3 = 14$$
$$x_1 + 2x_2 + 3x_3 = 14$$

(2+6)

5. Obtain y(1.5) to the following differential equation using Runge-Kutta 4th order method.

$$\frac{dy}{dx} + 2x^2 y = 1, \text{ with } y(1) = 0$$

taking $h = 0.25$ (8)

6. Write the finite difference formula for solving Poisson's equation. Hence solve the Poisson equation

$$\nabla^2 f = 3x^2y$$

over the domain $0 \leq x \leq 1.5$ and $0 \leq y \leq 3$ with $f = 0$ on the boundary and $h = 0.5$.

(1+7)

7. Write an algorithm and a C program for the secant method to find the roots of non-linear equation.

(4+8)

OR

Write an algorithm and a C program for the Simpson's $\frac{1}{3}$ rule to integrate a given function.

(4+8)