TRIBHUVAN UNIVERSITY
Institute of Science and Technology
2072

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 far as practicable. The figures in the margin indicate full marks.

Attempt all questions:

1. What are the sources of errors? Discuss various types of errors. Find the roots of the equation $x^2 + 5.6x - 10 = 0$ 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 $f(x) = ex - 4x^2 = 0$ 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

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)

$1\,Ox_i + x_2 + x_3 = 12$

$x + 10x_2 - .X_3 = 10$

$-2x_2 + 10x_3 = 9$

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 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)

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Attempt all questions:

8. What are the sources of errors? Discuss various types of errors. Find the roots of the equation $x^2 + 5.6x - 10 = 0$ by trial and error method up to 4 significant digits. (1+3+4)
9. Describe Newton's method and its convergence. Find the root of equation $f(x) = ex - 4x^2 = 0$ using Newton method up to 5 decimal places. (4+4)
10. 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

11. 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

12. 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)

$1\,Ox_i + x_2 + x_3 = 12$

$x + 10x_2 - X_3 = 10$

$-2x_2 + 10x_3 = 9$

13. 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 series method.
$y = (x^3 + xy^2)e^{(-x)}$, y(0) =1, to find y at x = 0.1, 0.2, 0.3.

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