

Tribhuvan University
Institute of Science and Technology
2082
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Bachelor Level / Second Year/ Third Semester/ Science
Computer Science and Information Technology (CSC 207)
(Numerical Method)
(OLD COURSE)

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.

Section A

Attempt any TWO questions:

(2 × 10 = 20)

1. Explain different types of numerical errors with example. Find the root of the equation $f(x) = x^3 + 3x + 1$ in the using Newton Raphson Method using initial value $x_0 = 3$. [4 + 6]
2. What is interpolation? Find the functional value at $x = 0.5$ from the following data using forward difference formula. [2 + 8]

X	0	0.2	0.4	0.6	0.8
$f(x)$	0	0.24	0.55	0.92	1.63

3. Evaluate $\int_1^2 e^{x^2} dx$ using Simpson's rule with $n=6$. Also evaluate the same integral using Gaussian 3-point formula and compare the result. [5 + 5]

Section B

Attempt any EIGHT questions:

(8 × 5 = 40)

4. Solve the system of linear equation using Gauss elimination method. [5]

$$\begin{aligned} 3x + 6y + z &= 16 \\ 2x + 4y + 3z &= 13 \\ x + 3y + 3z &= 9 \end{aligned}$$
5. Solve the following differential equation $\frac{dy}{dx} = 3x + \frac{y}{2}$ with $y(0) = 1$ for $x = 0.2$ ($h = 0.1$) using Euler's Method. [5]
6. Solve the Poisson's equation $\nabla^2 f = 2x^2 y^2$ over the square domain $0 \leq x \leq 3$ and $0 \leq y \leq 3$ with $f = 0$ on the boundary and $h=1$. [5]
7. What is initial value problem? Use RK fourth order method to estimate $y(0.4)$ of the equation $\frac{dy}{dx} = x^2 + y^2$ with $y(0)=0$ (assume $h=0.2$). [5]
8. Calculate the integral value of $\int_0^3 \frac{1}{x+4} dx$ by using Simpson's 3/8 rule with 9 segments. [5]
9. Find the root of $e^x - 3x = 0$, using bisection method correct to two decimal places. [5]
10. Apply Gauss-Jordan elimination method to solve the following system of equations: [5]

$$\begin{aligned} x + y + z &= 9 \\ 2x - 3y + 4z &= 13 \\ 3x + 4y + 5z &= 40 \end{aligned}$$
11. Fit a second-degree polynomial $y = a + bx + cx^2$ to the data (1, 1.1), (1.5, 1.3), (2.0, 1.6), (2.5, 2.0), (3.0, 2.7), (3.5, 3.4) and (4, 4.1). [5]
12. Explain about least square linear regression and describe its application. [3 + 2]