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Name· ·

Reg. No...

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, JANUARY 2005

Computer Science

CS 104—NUMERICAL METHODS

Time : Three Hours

Maximum : 60 Marks

Answer any **five** *questions from Part A and any* **three** *from Part B.*
Any missing data may be assumed and stated accordingly.

Part A

1. Obtain a root of the equation $x^3 + x^2 + x + 7 = 0$ by using bisection method (apply five iterations).
2. Solve the quadratic equation $x^3 + 9.9x - 1 = 0$ using two decimal digit floating arithmetic with rounding.
3. Solve the system of non-linear equations by Newton's method $x^2 - y^2 = 4$ and $x^2 + y^2 = 16$.
4. Solve the system of equations by Gauss Seidal method.

   $2x_1 + x_2 + x_3 = 5$

   $3x_1 + 5x_2 + 2x_3 = 15$

   $2x_1 + x_2 + 4x_3 = 8$

5. Find the Lagrange's interpolating polynomial for the following data :—

x	2	2.5	3.0
y	0.69315	0.91629	1.09861

6. Evaluate $\int_0^6 \dfrac{dx}{1 + x^2}$ using Simpson's rule.

7. Solve by Euler's method $\dfrac{dy}{dx} = x + y$ and $y(0) = 0$. Compute $y(0.4)$ by taking $h = 0.2$.

(5 x 3 = 15 marks)

Part B

1. Explain the predictor-corrector formulae and use this to tabulate the solution of $\dfrac{dy}{dx} = x + y$

   $y(0) = 0$ for $0.4 < x$ 1.0 with $h = 0.1$.

2. Find the largest eigen value and corresponding eigen vectors of the matrix $\begin{vmatrix} 5 & 2 & 1 & -2 \\ 2 & 6 & 3 & -4 \\ -2 & -4 & 2 & 1 \end{vmatrix}$

3. Explain the Spline interpolation a function $f(x)$ is defined as follows

   $f(x) \quad \begin{matrix} 1 + x, & 0 & x \\ 1 + x + (x - 3)^3, & 3 & \end{matrix}$. Show that $f(x)$ is a cubic Spline in $[0, 4]$.

4. Use Bairstow's method to obtain the quadratic factors of $f(x) = x^4 - 6x^3 + 18x^2 - 24x + 16 = 0$.

(3 x 15 = 45 marks)