BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

June, 2008

CS-71 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 hours   *Maximum Marks : 75*

Note : Question number 1 is **compulsory**. Attempt any **three** questions from the rest. In total you have to answer **four** questions.

1. (a) If the number $x^* = 0.678$ approximates the number $x = 0.6775$ correct upto n significant decimal digits, then calculate the value of n.   5

    (b) Evaluate $f(x) = \dfrac{x^3}{x - \sin x}$ when $x = 0.12 \times 10^{-10}$ using two digit arithmetic.   5

    (c) If $u = \dfrac{5xy^2}{z^3}$ and error in x, y, z is 0.001, compute the relative maximum error in u when $x = y = z = 1$.   5

    (d) Prove that $e^{-hD} = 1 - \nabla$.   5

    (e) If a, b, c, d are arguments of $f(x) = \dfrac{1}{x}$, show that
    $$f(a, b, c, d) = \dfrac{-1}{abcd}.$$ 5

(f) Use Lagrange's Interpolation formula to find the value of y when x = 10, if the value of x and y are given as below :   5

x	5	6	9	11
y	12	13	14	16

2. (a) For the following equation

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

determine initial approximation for finding the smallest positive root. Use these to find the roots correct to three decimal places with the following methods :

    (i) Regula Falsi Method   5

    (ii) Newton Raphson Method   5

(b) Find cubic polynomial which takes the following values :

$$y(0) = 1 \quad y(1) = 0 \quad y(2) = 1 \quad y(3) = 10.$$

Find $y(4)$ using Newton's Difference Interpolation formula.   5

3. (a) Find a real root of the equation $x^3 + x^2 - 1 = 0$ on interval [0, 1] with an accuracy of 10^{-4} using iteration method.   5

(b) Solve the system of following equations using Gauss Elimination method :   5

$$4x_1 + x_2 + x_3 = 4$$
$$x_1 + 4x_2 - 2x_3 = 4$$
$$3x_1 + 2x_2 - 4x_3 = 6$$

(c) By using Simpson $\frac{1}{3}$rd rule, evaluate $\int\limits_{0}^{1} \frac{dx}{1+x^2}$.

Divide the interval into six equal parts.   5

4. (a) Solve by Gauss-Seidal Method upto third iteration :

$$8x - 3y + 2z = 20$$
$$4x + 11y - z = 33$$
$$6x + 3y + 12z = 35$$

(b) Find $\int_{1}^{7} f(x)\, dx$ using Trapezoidal Rule for the following :   **5**

x	y
1	2·105
2	2·808
3	3·614
4	4·604
5	5·857
6	7·451
7	9·467

(c) Solve $y^1 = - y$ with $y(0) = 1$ for $x = 0\cdot04$ and step length $0\cdot01$ using Euler's method.   **5**

5. (a) Given $\dfrac{dy}{dx} = \sqrt{x+y}$ with $y(0\cdot4) = 0\cdot41$. Find $y(0\cdot6)$ with $h = 0\cdot2$ using RKM of fourth order.   **5**

(b) Find a root of the equation $x^3 - 2x - 5 = 0$ using Bisection method in three iterations.   **5**

(c) If x^* approximates x correct to 4 significant decimal digits then calculate how many significant decimal digits $e^{x^*/100}$ approximates $e^{x/100}$.   **5**