CS-71

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 $x^* = 0{\cdot}678$ approximates the number $x = 0{\cdot}6775$ correct upto n significant decimal digits, then calculate the value of n. 5

(b) Evaluate $f(x) = \dfrac{x^3}{x - \sin x}$ when $x = 0{\cdot}12 \times 10^{-10}$ 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 $f(x) = \frac{1}{x}$, show that

$f(a, b, c, d) = \frac{-1}{abcd}$. 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 $\int_0^1 \frac{dx}{1+x^2}$.

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 $x = 0{\cdot}04$ and step length $0{\cdot}01$ using Euler's method. *5*

5. (a) Given $\frac{dy}{dx} = \sqrt{x+y}$ with $y(0{\cdot}4) = 0{\cdot}41$. Find $y(0{\cdot}6)$ with $h = 0{\cdot}2$ 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*