CS-71

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

June, 2007

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 $x^* = 4{\cdot}3$ approximates the number $x = 4{\cdot}\dot{3}05$ correct upto n significant decimal digits, then calculate the value of n. 5

(b) Let $f(x) = x^{1/10}$, and suppose that x approximates x^* correct upto 12 significant digits. Then compute upto how many significant decimal digits $f(x^*)$ approximates f(x). 5

(c) Give one example of an equation with "multiple roots". And justify your answer. Also, write a polynomial equation of degree three which has a double root 62 and a single root 0. 5

(d) Estimate the missing data entry (a) using Newton's divided difference method : 5

x	1	2	a	4
f(x)	3	0	2	4

(e) If $f(x) = x^3$, then prove that for $a > 0$, $b > 0$, $c > 0$, we do also have the divided difference $f[a, b, c] > 0$. 5

(f) Prove that $hD \equiv \log_e E$, where D stands for "$\frac{d}{dx}$" and E is the advance operator. 5

2. (a) Find a real root correct upto three decimal places of the function

$$\phi(x) = x^3 - 2x - 5$$

using

(i) Bisection method,

(ii) Newton Raphson method. *5+5=10*

(b) Using Lagrange's interpolation formula, obtain the value of y(1) from the following table : 5

x	0	1	3	4
y(x)	2	0	1	2

3. (a) Solve the system of following equations using Gauss Elimination method : 5

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

$$2x_1 + x_2 + x_3 = 0$$

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

(b) When is a matrix A said to be strictly diagonally dominant ? Give an example of 3×3 matrix A which is strictly diagonally dominant. 5

(c) Find the minimum number of intervals required to evaluate

$$\int_0^1 \frac{dx}{1+x}$$

with an accuracy of 10^{-5} using Simpson's $\frac{1}{3}$ rule. 5

4. (a) Find a solution of the system of linear equations : 5

$$83x + 11y - 4z = 95$$

$$7x + 52y + 13z = 104$$

$$3x + 8y + 29z = 71$$

(b) Given $1^3 = 1$, $2^3 = 8$ and $4^3 = 64$. Using numerical differentiation, compute the value of 3^2 from these data. 5

(c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ with six subintervals using Trapezoidal rule. Hence find an approximate value of π. 5

5. (a) In RKM of second order or third order or fourth order, what is the significance of the term "order" ? Explain it for all the above cases by taking one example of each order. 5

(b) Solve the IVP : $y' = y + x$, $y(0) = 1$ with $h = 0{\cdot}1$ in the interval $[0, 0{\cdot}2]$ using Euler's method. 5

(c) If $u = \dfrac{4x^2y^3}{z^4}$ and errors in x, y, z be $0{\cdot}001$, compute the relative maximum error in u when $x = y = z = 1$. 5