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CS-71

BACHELOR IN COMPUTER APPLICATIONS

05557

Term-End Examination

June, 2012

CS-71 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 hours *Maximum Marks : 75*

Note : *Question number 1 is* ***compulsory****. Attempt* ***any three*** *from question number 2 to 5. Calculator is* ***allowed****.*

1. (a) Solve the quadratic equation **6x5=30**

$x^2 + 9.\ 9x - 1 = 0$ using two decimal digit floating arithmetic with rounding.

(b) Evaluate $f(x) = \dfrac{x^3}{x - \sin x}$ when

$x = .12 \times 10^{-10}$ using two digit arithmetic.

(c) Perform three iterations using Gauss Seidal for following system of equation rounded to 4 decimal

$$\begin{bmatrix} -8 & 1 & 1 \\ 1 & -5 & -1 \\ 1 & 1 & -4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 1 \\ 16 \\ 7 \end{bmatrix}.$$

(d) Find $f'(x)$, given f_0, f_1, f_2 at x_0, x_1, x_2 respectively. Using lagrange interpolation.

(e) Evaluate $\int_{0.2}^{0.4} (\sin x - \ln x + e^x)\,dx$ using Trapezoidal rule, h = 0.1.

(f) Perform three iterations to find root of the equation $x^3 - 3x - 5 = 0$ by Newton Raphson method.

2. (a) Find real root of the equation $f(x) = x^3 - x - 1 = 0$ using Bisection Method in 4 iterations. **3x5=15**

(b) Solve the following system of equation by Gauss Elimination method

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

(c) Find lagrange Interpolating polynomial for the following data :

x	1/4	1/3	1
$f(x)$	−1	2	7

3. (a) Find root of the equation $f(x) = x^3 - 2x - 5 = 0$ using Regula Falsi method correct to 2 decimal places. **3x5=15**

(b) Perform three iteration of Jacobi method for following system of equation.

$$\begin{bmatrix} 5 & -1 & -1 & -1 \\ -1 & 10 & -1 & -1 \\ -1 & -1 & 5 & 1 \\ -1 & -1 & -1 & 10 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} -4 \\ 12 \\ 8 \\ 34 \end{bmatrix}$$

starting with X = (0, 0, 0, 0).

(c) Solve $\int_0^1 \frac{dx}{1+x}$ using Simpson $\frac{1}{3}$ rule, $h = \frac{1}{2}$.

4. (a) Use Taylor Series method recursively to solve $y' = x^2 + y^2$, $y(0) = 0$ for the interval (0, 0.4), Using subinterval of size 0.2. **3x5=15**

(b) Find cubic polynomial which takes $y(0) = 1$, $y(1) = 0$, $y(2) = 1$, $y(3) = 10$ and hence find $y(4)$ by Newton Forward Difference for Interpolation.

(c) Perform two iteration of Newton Raphson method on the quadration equation $x^4 - 4x^2 + 4 = 0$, $x_0 = 1.5$. It has double root.

5. (a) Evaluate $\int_1^5 f(x)dx$ using Simpson $\frac{1}{3}$ rule on following data. **3x5=15**

x	1	2	3	4	5
$f(x)$	13	15	70	80	100

(b) Given $\frac{dy}{dx} = y - x$, $y(0) = 2$. Find $y(0.1)$ and $y(0.2)$ using Runge Kutta method of second order, correct to 4 decimal places.

(c) Solve $y' = -y$ with $y(0) = 1$ for $x = 0.04$ and step length $= 0.01$ using Euler's Method.