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CS-71

BACHELOR OF COMPUTER APPLICATIONS
(Pre-Revised)

05364

Term-End Examination

December, 2014

CS-71 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 hours *Maximum Marks : 75*

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

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1. (a) Show that $\frac{(a-b)}{c} \neq \frac{a}{c} - \frac{b}{c}$, where $a = 0{\cdot}41$, $b = 0{\cdot}36$ and $c = 0{\cdot}70$ using two decimal digit arithmetic with rounding. 5

(b) Given $\sqrt{2} = 1{\cdot}414214$. Approximate it to 1·414. Find absolute and relative error in approximation. 5

(c) Solve the following system of equations using Jacobi method, rounded to four decimal places : 5

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

(d) Using Newton-Raphson method, find the square root of 10 with initial approximation $x_0 = 3$. 5

(e) Find the value of x, when y = 3 for the following values using Lagrange's Interpolation Polynomial : 5

x	4	7	10	12
y	– 1	1	2	4

(f) Solve the following initial value problem using optimal R-K method of $O(h^2)$

where $y' = -ty^2$, $y(2) = 1$.

Find $y(2{\cdot}1)$; $h = 0{\cdot}1$. 5

2. (a) Find real root of the equation $f(x) = x^3 - 5x + 1 = 0$ using Bisection method, perform 3 iterations only. 5

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

$2x + y + z = 10$

$3x + 2y + 3z = 18$

$x + 4y + 9z = 16$

(c) Find Lagrange Interpolating Polynomial for

x	1	2	4
f(x)	1	7	61

Also, find f(3). 5

3. (a) Find root of the equation $x^3 - 5x + 1 = 0$ by Regula Falsi method, perform 3 iterations. 5

(b) Perform two iterations of Gauss-Seidel method to solve the following system of equations :

$$10x_1 - 2x_2 - x_3 - x_4 = 3$$

$$-2x_1 + 10x_2 - x_3 - x_4 = 15$$

$$-x_1 - x_2 + 10x_3 - 2x_4 = 27$$

$$-x_1 - x_2 - 2x_3 + 10x_4 = -9$$

starting with $(x_1, x_2, x_3, x_4) = (0,0,0,0)$. 5

(c) Evaluate $\int_1^7 f(x)\,dx$ using Trapezoial Rule for the following : 5

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

4. (a) Using Third Order Taylor Series method, find the solution of differential equation $xy' = x - y$, $y = 2$ at $x = 2$, $h = 1$. 5

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by subdividing the interval (0, 1) into 6 equal parts using $\frac{1}{3}^{rd}$ Simpson Rule. 5

(c) Construct Newton's Forward Difference table for the data :

x	3	5	7	9
f(x)	6	24	38	108

Hence approximate f(4) from Newton's forward difference interpolating polynomial. *5*

5. (a) Use Euler method to find solution of $y' = t + y$ given $y(0) = 1$. Find solution on $[0, 0{\cdot}8]$ with $h = 0{\cdot}2$. *5*

(b) Use fourth order Runge-Kutta method for equation $\frac{dy}{dx} = 1 + y^2$ where $y = 0$ when $x = 0$.

Find $y\ (0{\cdot}2)$, $h = 0{\cdot}2$ upto four decimal places. *5*

(c) Prove that $\delta = \sqrt{E} - \frac{1}{\sqrt{E}}$. *5*
