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CS-71

BACHELOR IN COMPUTER APPLICATIONS

10017

Term-End Examination

December, 2010

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. Use of Calculator is permitted.*

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1. (a) (i) The approximations to the number $\frac{2}{3}$ are given as 0.6, 0.66, and 0.67. Which of these is the best approximation and why ? **1+4**

(ii) Find to how many significant digits is the value $\frac{355}{113}$, an accurate approximation to $\pi = 3.14159265....$

(b) If $x = 0.178693 \times 10^1$, $y = 0.178439 \times 10^1$ are accurate to six significant digits, then find the number of significant digits in $z = x - y$. **5**

(c) Prove the following relations : 2+3

(i) $\Delta\left(\frac{f_i}{g_i}\right) = \frac{g_i \Delta f_i - f_i \Delta g_i}{g_i\, g_{i+1}}$

(ii) $\Delta + \nabla = \frac{\Delta}{\nabla} - \frac{\nabla}{\Delta}$.

(d) Solve the following equations by Gauss - Seidal iteration method : 5

$20x + y - 2z = 17$

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

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

Start with the approximation $x_0 = y_0 = z_0 = 0$.

(e) Find the Lagrange interpolating polynomial that fits the following data : 5

x	-2	1	0	2
$f(x)$	3	-3	1	-1

Also compute the approximate value of $f(1.5)$.

(f) Compute the cube root of 24 by using Newton - Raphson method. 5

2. (a) Solve the following equations by Jacobi's method : 3x5=15

$5x + 2y + z = 12$

$x + 4y + 2z = 15$

$x + 2y + 5z = 20.$

(b) Find the real root of the equation

$3x = \cos x + 1$

by Newton - Raphson method.

(c) Using Newton's interpolation formula, find the value of $f(1.6)$ if

x :	1	1.4	1.8	2.2
$f(x)$:	3.49	4.82	5.96	6.5

3. (a) Solve the following equations by Gauss - Elimination method : **3x5=15**

$2x_1 + 4x_2 + x_3 = 3$

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

$x_1 - x_2 + x_3 = 6$

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

(c) Find a real root of the equation

$x^3 - 2x - 5 = 0$

by the Regula - Falsi method correct to three decimal places.

4. (a) Using Runge - Kutta method of order four, find y (0.2) given that **3x5=15**

$\frac{dy}{dx} = 3x + \frac{y}{2}$,

$y(0) = 1$, taking $h = 0.1$

(b) A root of the equation

$xe^x - 1 = 0$ lies in the interval (0.5, 1.0).

Determine this root correct to three decimal places using regula - falsi method.

(c) Evaluate $\int_0^2 \frac{dx}{x^2 + 2x + 10}$

Using the Simpson's $\frac{1}{3}$ rule with h = $\frac{1}{4}$.

5. (a) Find a real root of the equation **3x5=15**

$x^4 - x - 10 = 0$

Using the bisection method correct to three decimal places.

(b) Using Newton - Raphson method obtain a root of the equation

$x^3 - 5x + 1 = 0$

correct to three decimal places.

Assume $x_0 = 0.0$

(c) For the data

x	0	0.2	0.4	0.6	0.8	1.0
f(x)	7.0	6.008	5.064	4.216	3.512	3.0

Find an approximation to f (0.1) and f (0.3) by using Newton's Forward difference formula.
