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CS-71

BACHELOR OF COMPUTER APPLICATIONS (BCA) (Pre-Revised)

Term-End Examination

December, 2015

CS-71 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 hours *Maximum Marks : 75*

Note : *Question number 1 is* ***compulsory****. Attempt any* ***three*** *questions from questions number 2 to 5. Scientific calculator is permitted.*

1. (a) What is meant by absolute and relative errors ? Explain each with suitable example. *5*

(b) Find the approximate value, correct to three decimal places, of the real root which lies between – 2 and – 3 of the equation

$$x^3 - 3x + 4 = 0,$$

using the method of Regula-Falsi. *5*

(c) Find a real root of the equation $x^3 - 2x - 5 = 0$, by using the method of Bisection, correct to three decimal places. *5*

(d) Find a real root of the equation $x^3 - 3x - 5 = 0$ by using the method of Regula-Falsi, correct to three decimal places. *5*

(e) Find a real root of the equation $x \sin x + \cos x = 0$ by using the method of Newton-Raphson, correct to three decimal places. *5*

(f) Show that $a(b - c) \neq ab - ac$, where $a = 0{\cdot}5555 \times 10^1$, $b = 0{\cdot}4545 \times 10^1$ and $c = 0{\cdot}4535 \times 10^1$. *5*

2. (a) Find a real root of the equation $x^3 + x - 1 = 0$ by using the method of Bisection, correct to three decimal places. *5*

(b) Compute a root of the equation $x^2 - 3x + 2$ lying between 0 and 1·5 by using the method of Newton-Raphson, correct to three decimal places. *5*

(c) In the table below, the values of y are consecutive terms of a series of which the number 21·6 is the 6^{th} term. Compute the tenth term of the series by the method of Newton's interpolation formula. *5*

x	3	4	5	6	7	8	9
y	2·7	6·4	12·5	21·6	34·3	51·2	72·9

3. (a) Using Lagrange's interpolation formula, find the form of the function f(x) from the following table. Hence compute f(2·5). *5*

x	2	3	4
f(x)	11	49	123

(b) Given $\frac{dy}{dx} = \frac{y - x}{y + x}$, with $y = 1$ for $x = 0$.

Find y approximately for $x = 0{\cdot}1$ by Euler's method (five steps). *5*

(c) If $f(x) = \frac{1}{x}$, then show that

$$f[a, b, c, d] = \frac{1}{a\,b\,c\,d}$$ *5*

4. (a) Solve the following system of equations by Cramer's rule : *5*

$$2x + y + z = 7$$
$$3x + 2y + 3z = 16$$
$$x + 4y + 9z = 36$$

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

$$10x_1 + x_2 + x_3 = 6$$
$$x_1 + 10x_2 + x_3 = 6$$
$$x_1 + x_2 + 10x_3 = 6$$

(c) Solve the following system of equations by Gauss-Seidel Iteration : 5

$$x_1 + 9x_2 - 2x_3 = 36$$

$$2x_1 - x_2 + 8x_3 = 121$$

$$6x_1 + x_2 + x_3 = 107$$

5. (a) Find an approximate value of the root of the equation

$$x^3 + x - 1 = 0 \qquad \text{near} \quad x = 1,$$

using the method of Regula-Falsi, correct to three decimal places. 5

(b) The velocities of a car (running on a straight road) at intervals of 2 minutes are given below :

Time in minutes	0	2	4	6	8	10	12
Velocity in km/hr	0	22	30	27	18	7	0

Apply Simpson's $\frac{1}{3}$rd rule to find the distance covered by the car. 5

(c) Use the Runge-Kutta fourth order method to find the value of y

when $x = 0{\cdot}2$, given that $y = 1$ when $x = 0$.

Given that

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}.$$ 5
