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CS-71

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

Term-End Examination

June, 2019

00682

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**. Use of scientific calculator is permitted.*

1. (a) (i) Round-off the following numbers to four significant figures :

38·46235; 0·70029; 0·0022218 and 2·36425

(ii) If $y = 4 \cos x - 6x$, find the percentage error in y at $x = 1$, given $\Delta x = 0{\cdot}005$.

2+3=5

(b) If $N = \frac{4x^2y^3}{z^4}$ and errors in x, y, z are respectively 0·1, 0·05, and 0·15, compute the maximum relative error in N when $x = y = z = 1$. *5*

(c) (i) Write the following system of linear equations in matrix form :

$$9x + 14y = 37$$

$$-11x + 6y = 1$$

(ii) Find an interval in which the following equation has a root : *2+3=5*

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

(d) Prove that

$$\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{1}{4}\delta^2}\,. \qquad 5$$

(e) The following table gives corresponding values of x and y. From the difference table, express y as a function of x. *5*

x	0	1	2	3	4
y	3	6	11	18	27

(f) Find a real root of the following equation correct to 3 decimal places using bisection method : *5*

$$x^4 - x - 9 = 0$$

2. (a) Use Lagrange's interpolation formula to find y where x = 5, from the following data :

x	0	1	3	8
y	1	3	13	123

(b) Find a real root of the following equation :

$$x e^x = \cos x$$

correct to three decimal places using iterative method.

(c) The speed v metres per second of a car, t seconds after it starts, is shown in the following table :

t	v
0	0
12	3·60
24	10·08
36	18·90
48	21·60
60	18·54
72	10·26
84	5·40
96	4·50
108	5·40
120	9·00

Using Simpson's $\frac{1}{3}$rd rule, find the distance travelled by the car in 2 minutes. *3×5=15*

3. (a) Find a real root of the following equation :

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

correct to three decimal places using Newton-Raphson's method.

(b) Find a root of the following equation :

$$x \log_{10} x = 1{\cdot}2$$

correct to three decimal places using Regula Falsi method.

(c) Solve the following system of linear equations by Cramer's rule : *3×5=15*

$$10x + y + z = 12$$
$$x + 10y + z = 12$$
$$x + y + 10z = 12$$

4. (a) Solve the following system of linear equations by Gauss elimination method :

$$x + 2y + z = 8$$
$$2x + 3y + 4z = 20$$
$$4x + 3y + 2z = 16$$

(b) Solve the following system of linear equations by Gauss-Seidel iterative method :

$$8x + y + z = 8$$
$$2x + 4y + z = 4$$
$$x + 3y + 5z = 5$$

(c) Use Jacobi's iteration method to solve the following system of equations : *3×5=15*

$$5x + 2y + z = 12$$
$$x + 4y + 2z = 15$$
$$x + 2y + 5z = 20$$

5. (a) Find a real root of the equation

$$x^3 - 4x - 9 = 0,$$

correct to three decimal places by the Secant method.

(b) Compute y for $x = 1{\cdot}1$ and $x = 1{\cdot}2$, if

$$\frac{dy}{dx} = \frac{x^2 + y^2}{2xy}, \text{ if } y(1) = 2.$$

(c) 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 i.e. take $h = 0{\cdot}02$). *3×5=15*
