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CS-71

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

01955

Term-End Examination

June, 2018

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) If 0·182 is the approximate value of $\frac{2}{11}$, find the absolute, relative and percentage errors. 5

(b) Using bisection method, find a real root of the equation

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

(c) Find the root of the equation

$$xe^x = \cos x$$

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

(d) Solve the following equations by Cramer's rule : 5

$$5x - 2y + 3z = 18$$
$$x + 7y - 3z = -22$$
$$2x - y + 6z = 22$$

(e) Prove the following : 5

(i) $E^{1/2} + E^{-1/2} = 2\mu$

(ii) $\delta = E^{1/2} - E^{-1/2}$

(f) If $f(x) = x^4$, find the value of f(a, b, c). 5

2. (a) By the secant method, find the root that lies between 1 and 2, correct to three decimal places, of the equation

$$x^3 - 2x - 1 = 0.$$ 5

(b) Apply the Newton-Raphson method to find an approximate root, correct to three decimal places, of the equation

$$x^4 - x - 10 = 0.$$ 5

(c) Using Lagrange's interpolation, find the value of x, when y = 15, from the given data : 5

x	5	6	9	11
y	12	13	14	16

3. (a) Solve the following equations by Gauss' elimination method : 5

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

(b) Given $\frac{dy}{dx} = \frac{y - x}{y + x}$ with initial condition $y = 1$ at $x = 0$; find y for $x = 0{\cdot}10$ using Euler's method. *5*

(c) From the following data, find f(0·7) approximately by using Newton's backward formula : *5*

x	0·10	0·20	0·30	0·40	0·50	0·60
f(x)	2·68	3·04	3·38	3·68	3·96	4·21

4. (a) Use Jacobi's iteration method to solve the following system of equations : *5*

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

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

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

(b) Using Runge-Kutta method, solve $\frac{dy}{dx} = xy$ for $x = 1{\cdot}2$. Initial values are : $x = 1$, $y = 2$. Take $h = 0{\cdot}2$. *5*

(c) Construct Newton's forward interpolation polynomial for the following data :

x	4	6	8	10
y	1	3	8	16

Hence evaluate y for $x = 5$. *5*

5. (a) Solve the following equations by using Gauss-Seidel method : *5*

$$10x_1 + x_2 + x_3 = 12$$

$$2x_1 + 10x_2 + x_3 = 13$$

$$2x_1 + 2x_2 + 10x_3 = 14$$

(b) Given that :

x	*ln* x
4·0	1·3863
4·2	1·4351
4·4	1·4816
4·6	1·5261
4·8	1·5686
5·0	1·6094
5·2	1·6487

Evaluate $\int_{4}^{5.2} ln\ x\ dx$ by using

(i) Trapezoidal rule, and

(ii) Simpson's $\frac{1}{3}^{rd}$ rule. *5*

(c) Obtain Taylor series for y(x) where $y' + y^2 = x$ given, y(0) = 1. Use it to compute y(0·1), correct to four decimal places. *5*