No. of Printed Pages : 5

CS-71

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

01710 **Term-End Examination**

December, 2017

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.*

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1. (a) (i) Round off the following numbers to two decimal places :

90·9986; 56·1081; 95·945; 10·0062; 105·5546

(ii) For each of the following numbers, find the number of significant digits :

$2{\cdot}64 \times 10^{24}$; 0·2370; 6·320; 6·032; 0·00096501 *5*

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

(c) Solve the following system of equations by using the Gauss-elimination method : 5

$$3x + 4y - z = 8$$

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

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

(d) Find the real root of the equation

$$x e^x - \cos x = 0$$

by the Newton-Raphson method, correct to three decimal places. 5

(e) Prove that : 5

(i) $\mu^2 = 1 + \frac{1}{4}\delta^2$

(ii) $\nabla^2 = 1 - 2E^{-1} + E^{-2}$

(f) Find the real root of the equation

$$x e^x = 2$$

by iterative method, correct to 3 decimal places. 5

2. (a) Apply Lagrange's interpolation formula to find f(x) from the following data :

x	0	1	4	5
f(x)	4	3	24	39

Also compute f(2·5). 5

(b) Using Newton's forward interpolation formula on the table of values given below, obtain the value of y when x = 1·4 : 5

x	1·1	1·3	1·5	1·7	1·9
y	0·21	0·69	1·25	1·89	2·61

(c) A river is 80 m wide. The depth d in metres at a distance x metres from one bank is given by the following table :

x	d
0	0
10	4
20	7
30	9
40	12
50	15
60	14
70	8
80	3

Find approximately the area of the cross-section by using Simpson's $\frac{1}{3}$ rule. 5

3. (a) Find a root of the equation

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

correct to three decimals, using the Bisection method. 5

(b) Find a root of the equation

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

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

(c) Solve the following system of equations by using Jacobi's iteration method : 5

$$8x + y + z = 8$$

$$2x + 4y + z = 4$$

$$x + 3y + 5z = 5$$

4. (a) Evaluate $\int_1^3 \frac{dx}{1+x}$ by subdividing the interval (1, 3) into 8 equal parts, and using Trapezoidal rule. 5

(b) Solve the following system of equations by using Cramer's rule : 5

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

$$x_1 + x_2 - x_3 = 5$$

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

(c) Using the Runge-Kutta method of fourth order, compute $y(0{\cdot}1)$, given that

$$\frac{dy}{dx} = xy + y^2 , \; y(0) = 1.$$ 5

5. (a) If one root of the equation

$x^4 + x^3 - 25x^2 + 41x + 66 = 0$ is $(3 + i\sqrt{2})$,

then find out the other roots. 5

(b) Find a real root of the equation

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

by using the Secant method. 5

(c) Using Euler's method, find an approximate value of y corresponding to $x = 0{\cdot}1$, given that $\frac{dy}{dx} = x + y + xy$, and $y(0) = 1$.

Take $h = 0{\cdot}05$. 5