BACHELOR OF COMPUTER APPLICATION (BCA) (PRE-REVISED)

Term-End Examination

June, 2020

CS-71 : COMPUTER ORIENTED NUMERICAL TECHNIQUES

Time : 3 Hours   *Maximum Marks : 75*

Note : *(i) Question No. 1 is compulsory.*

*(ii) Attempt any **three** questions from question nos. 2 to 5.*

(iii) Use of scientific calculator is permitted.

1. (a) (i) State the number of significant figures in the following : 2

0.007 m²; 2.64 × 10²⁴ kg; 0.23709 g/cm³; 0.0006032

(ii) Let :   3

$$a = 0.459 \times 10^0$$

$$b = 0.356 \times 10^{-3}$$

and $c = 0.354 \times 10^{-3}$

Using three digit decimal arithmetic with rounding, compute $(a + b) + c$; and $a + (b + c)$.

(b) If :   5

$$y = 4 \cos x - 6x$$

find the relative error and percentage error in y at $x = 1$ given $\Delta x = 0.005$.

(c) Evaluate cub root of 73 with the help of Newton-Raphson method.   5

(d) Prove that :   5

$$\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{1}{4}\delta^2}$$

(e) Apply Trapezoidal rule to find the area bounded by the x-axis, the lines $x = 1$, $x = 4$ and the curve through the points :   5

x	y
1	2
1.5	2.4
2	2.7
2.5	2.8
3.0	3.0
3.5	2.6
4	2.1

(f) Apply Lagrange's interpolation formula to find $f(x)$ from the following data :   5

x	$f(x)$
2	8
3	27
4	64

Also compute $f(3.5)$.

2. (a) Use Euler's method to find the solution of

$y' = t + y$, given $y\,(0) = 1$. Find the solution

on [0, .8] with $h = .2$.   5

(b) Apply Newton's forward interpolation

formula on the table of value given below,

to find y when $x = 2.4$:   5

x	$y = e^x$
1.7	5.474
1.8	6.050
1.9	6.686
2.0	7.389
2.1	8.166
2.2	9.025
2.3	9.974

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

$$x + \frac{1}{2}y + \frac{1}{3}z = 1$$

$$\frac{1}{2}x + \frac{1}{3}y + \frac{1}{4}z = 0$$

$$\frac{1}{3}x + \frac{1}{4}y + \frac{1}{5}z = 0$$

3. (a) Evaluate : 5

$$\int_0^6 \frac{1}{1+x^2}$$

by using Simpson's one-third rule. Take $h = 1.0$.

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

$$xe^x = 1$$

correct to three decimals using iteration method. 5

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

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

correct to three decimals using bisection method. 5

4. (a) Solve the following system of equations by using the Jacobi's method :   5

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

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

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

(b) Solve the following system of equations by using Gauss-Seidel iterative method :   5

$$5x_1 + 2x_2 + x_3 = 12$$

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

$$2x_1 - 3x_2 + 10x_3 = -45$$

(c) Using Euler's method, find y (0.6) of :

$$\frac{dy}{dx} = 1 - 2xy$$

given that y (0) = 0 taking $h = 0.2$.   5

5. (a) Find the approximate value, correct to three decimal places of the real root which lies between -2 and -3 of the equation :   5

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

using Regula-Falsi method.

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

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

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

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

(c) Use Runge-Kutta method of order four to find y at $x = 0.1$, 0.2, given that :   5

$$x [dy + dx] = y (dx - dy)$$

given that $y = 1$ when $x = 0$.

620
250