(i) Printed Pages: 3   Roll No. ....

(ii) Questions   : 9   Sub. Code : | 0 | 9 | 3 | 1 |
                            Exam. Code : | 0 | 0 | 2 | 9 |

Bachelor of Computer Applications 3rd Semester   (23)

(2123)

COMPUTER ORIENTED NUMERICAL METHODS

Paper : BCA–16–304

Time Allowed : Three Hours]   [Maximum Marks : 65

Note :—Attempt **five** questions in all, including Question No. **9** in Section–E, which is compulsory and taking **one** question each from Section A, B, C and D.

SECTION—A

1. Explain in brief how floating point numbers are stored in computers ? What are the factors that affect their accuracy and range ? With the help of suitable example, show that associative law of floating point addition may not be valid in numerical computations.   13

2. (a) What are various types of errors that can occur in numerical computations ? Explain by taking suitable examples.

   (b) For which x values, is there a potential for cancellation in the calculation of $y = \sqrt{x + \dfrac{1}{x}} - \sqrt{x - \dfrac{1}{x}}$? Rewrite the expression to compute y in a numerically stable fashion.   7,6

SECTION—B

3. Perform four iterations of Newton's Raphson method to find approximate value of $3\sqrt{7}$ using equation $x^3 = 7$ and starting approximation as 1. **13**

4. Starting with initial solution as $(x, y, z) = (0, 0, 0)$, perform three iterations of Gauss-Seidal method to solve the following system of equations :

$$2x - y = -1, \quad -x + 4y + 2z = 3, \quad 2y + 6z = 5. \qquad \textbf{13}$$

SECTION—C

5. Use the Newton Forward Difference Method to find a 3rd degree interpolating polynomial $P_3(s)$, where $s = \dfrac{x - x_0}{h}$ for the following equally spaced data values and use the Polynomial $P_3(s)$ you found to approximate $f(0.5)$:

x	0	0.2	0.4	0.6
f(x)	1	3	8	10

13

6. (a) Using the Trapezoidal rule, and dividing the interval of integration into three equal sub-intervals, compute the value of the definite integral $\displaystyle\int_{-1}^{+1} |x|\,dx$.

(b) Evaluate the integral $\displaystyle\int_{4}^{5.2} f(x)\,dx$ using Simpson's 3/8 rule and the following data values :

x	4	4.2	4.4	4.6	4.8	5.0	5.2
f(x)	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

6,7

SECTION—D

7. Apply Euler's modified method and Runga-Kutta order Two method to approximate y(1.3) using step size h = 0.1 for the following initial value problem :

$$\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x^2}, \; y(1) = 1 \qquad\qquad 13$$

8. What is meant by approximation of a function by using Chebyshev's series ? Use this method to approximate the series expansion of sin(x) up to three digits accuracy. 13

SECTION—E

(Compulsory Question)

9. (a) Differentiate between accuracy and precision in numerical computations.

    (b) What is the advantage of using partial pivoting when solving system of linear equations using Gauss Elimination method ?

    (c) Define inverse interpolation with an example.

    (d) State predictor-corrector methods to solve first order ordinary differential equation. Give examples.

$$3 \times 3, 4$$