

Roll No. ....

**DD-476**

**M. Sc. (Second Semester)  
EXAMINATION, May-June, 2020**

**COMPUTER SCIENCE**

**Paper Fifth**

**(Numerical Analysis)**

*Time : Three Hours*

*Maximum Marks : 100*

**Note :** Attempt any *two* parts from each question. All questions carry equal marks.

**Unit—I**

1. (a) Find a real root of the equation  $f(x) = x^3 - 4x - 9 = 0$ , using Bisection method in four stages.
- (b) Using Regula-Falsi method, find the real root of the equation  $x^4 - x - 10 = 0$ .
- (c) Solve the equation  $2x^4 - 4x^3 + 11x^2 - 9x - 26 = 0$  one root being  $\frac{1}{2} + \frac{5}{2}i$ .

**(B-36) P. T. O.**

## Unit—II

2. (a) Solve the following system by Gauss elimination method :

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

$$6x_1 + 4x_2 + 3x_3 = 0$$

$$20x_1 + 15x_2 + 12x_3 = 0$$

- (b) Factorise the matrix :

$$A = \begin{bmatrix} -2 & 4 & 8 \\ -4 & 18 & -16 \\ -6 & 2 & -20 \end{bmatrix}$$

in the form LU, where L is the units lower triangular matrix and U is the upper triangular matrix.

- (c) Find the characteristic equation of the matrix

$$A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix} \text{ and verify that it is satisfied by}$$

A and hence obtain  $A^{-1}$ .

## Unit—III

3. (a) Find the first term of the series whose second and subsequence terms are 8, 3, 0, -1, 0.
- (b) From the following table of values of  $x$  and  $f(x)$  determine  $f(0.23)$  :

$x$	$f(x)$
0.20	1.6596
0.22	1.6698
0.24	1.6804
0.26	1.6912
0.28	1.7024
0.30	1.7139

- (c) Using Lagrange's interpolation formula find the value of  $y$  for  $x = 9.5$  from the following table :

$x$	$y = f(x)$
7	3
8	1
9	1
10	9

## Unit—IV

4. (a) Calculate the first and second derivatives of the functions tabulated below, at the point  $x = 1.1$  :

$x$	$y = f(x)$
1.0	0
1.2	0.128
1.4	0.544
1.6	1.296
1.8	2.432
2.0	4.000

- (b) Find the value of  $\int_1^2 \frac{dx}{x}$  by Simpson's rule. Hence obtain approximate value of  $\log_e 2$ .
- (c) Calculate  $\int_0^{\pi/2} e^{\sin x} dx$  correct to four decimal places by Simpson's  $\frac{3}{8}$  rule.

## Unit—V

5. (a) Use Taylor's series method to find  $y$  for  $x = 0.1$  correct to four places of decimal, if satisfies  $\frac{dy}{dx} = x - y^2$  with  $y_0 = 1, x_0 = 0$ .
- (b) Explain Euler's method of the successive approximation for the solution of  $\frac{dy}{dx} = f(x, y)$  where  $y = y_0$  at  $x = x_0$ .
- (c) Solve the differential equation  $\frac{dy}{dx} = x^2 + y^2 - 2$ ; given  $y(-0.1) = 1.09, y(0) = 1, y(0.1) = 0.89$ , find  $y(0.2)$  by series expansion and then find  $y(0.3)$  by Milne's method.