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

Or

Apply Runge-Kutta method to find approximate value of y for $x = 0{\cdot}2$, in the steps of $0{\cdot}1$ if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ where $x = 0$.

❐❐❐❐❐d❐❐❐❐❐

Roll No. ..... Total No. of Sections : 3

Total No. of Printed Pages : 6

Code No. : A.C-291

Annual Examination, 2020

B.C.A. Part II

THE FOUNDATION OF COMPUTER SCIENCE

Paper I

[Numerical Analysis]

Time : Three Hours] [Maximum Marks : 50

Note : *Section 'A', containing 10 very short answer type questions, is compulsory. Section 'B' consists of short answer type questions and Section 'C' consists of long answer type questions. Section 'A' has to be solved first.*

Section 'A'

Answer the following very short answer type questions in one or two sentences. **1×10=10**

1. Define Bi-quadratic Equation.
2. Write statement of Bisection method.
3. Write statement of Cholesky's method.
4. Define power method.

5. Define Transformation to diagonal form.

6. Write Newton's Interpolation formula.

7. Write Newton's Divided Difference Interpolation formula.

8. Define Trapezoidal Rule.

9. Define Waddle's Rule.

10. Define Simpson's One-Third rule.

Section 'B'

Answer the following short answer type questions with word limit 150–200. **3×5=15**

1. Using Gauss-Jordan method, find the inverse of matrix

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & 4 \end{bmatrix}.$$

Or

Find the eigen values of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.

2. Apply Gauss-Jordan method to solve the equation $x + y + z = 9$, $2x - 3y + 4z = 13$, $3x + 4y + 5z = 40$.

Or

Find the largest eigen value and corresponding eigen vector of the matrix $\begin{bmatrix} 1 & 2 & 0 \\ 2 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ using power method.

3. Derive Newton's forward interpolation formula.

Or

Derive Newton's Divided Difference Interpolation formula.

4. Explain Newton-Cotes integration formula.

Or

Evaluate $\int_0^1 \frac{dx}{1+x}$ taking 7 ordinates by applying Simpson's $\frac{3}{8}$th rule. Deduce the value of $\log_e 2$.

2. Find the cubic polynomial which takes the following values :

x	0	1	2	3
$f(x)$	1	2	1	10

Hence or otherwise evaluate $f(4)$.

Or

Give the values :

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

evaluate $f(9)$ using Lagrange's method.

3. Peform three iterations of the bisection method to compute the positive root of the equation $f(x) = x^3 - 5x - 4 = 0$.

Or

Solve the equation $3x^3 - 4x^2 + x + 88 = 0$ one root being $2 + \sqrt{7}i$.

4. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Trapezoidal rule.

Or

Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's $\frac{3}{8}$ rule.

5. Given $\frac{dy}{dx} = 1 + xy$ with the initial condition that $y = 1$ when $x = 0$. Compute $y(0{\cdot}1)$ correct to four decimal by using Taylor's series method.

Or

Apply Euler's method, solve for Y at $x = 0{\cdot}6$ from $\frac{dy}{dx} = 1 - 2xy$, $y(0) = 0$ taking $h = 0{\cdot}2$.

Section 'C'

Answer the following long answer type questions with word limit 300–350. **5×5=25**

1. Compute the real root of $x^3 - 5x + 3$, in the interval [1, 2] by Regula-Falsi method.

Or

Compute $(12)^{\frac{1}{3}}$ by Newton-Raphson method.