Exam Code : D-24

Roll No. ....

Subject Code—62348

B.Sc. EXAMINATION

(Main/Re-appear)

(Batch 2022 Onwards)

(Third Semester)

MATHEMATICS

CML-307, Course–VI

Numerical Analysis

Time : 3 *Hours* *Maximum Marks* : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Section. Q. No. **1** is compulsory.

Compulsory Question

1. (a) Define shift operator.

(b) Prove that :

$$\Delta \log(cx+d) = \log\left(1+\frac{ch}{cx+d}\right).$$

(c) Write the iterative formula for finding the square root of a number N(np)

(d) Differentiate between algebraic and transcendental equations.

(e) Prove that $\underset{y_1 z}{\Delta^2} x^2$ is constant.

(f) Define order of convergence of an iterative process.

(g) State Descarte's rule of signs.

(h) Prove that :

$$y_4 = y_3 + \Delta y_2 + \Delta^2 y_1 + \Delta^3 y_1.$$

Section I

2. (a) State and prove Newton-Gregory formula for forward interpolation.

(b) Given $\sum_{11}^{20} f(x) = 44060$, $\sum_{14}^{20} f(x) = 38220$,

$\sum_{17}^{20} f(x) = 27178$ and $f(20) = 8450$. Find the value of $f(11)$.

3. (a) Given the following data, find $f(x)$ as a polynomial in powers of $(x - 5)$:

x	0	2	3	4	7	9
$f(x)$	4	26	58	112	466	922

(b) By using Lagrange's formula, find the value of y_4 if $y_{13} = 16$, $y_5 = 36$, $y_7 = 64$, $y_8 = 81$, $y_9 = 100$.

Section II

4. (a) Apply Sterling formula to find y_{25} from the following data :

$y_{20} = 24$, $y_{24} = 32$, $y_{28} = 35$, $y_{32} = 40$.

(b) Apply Gauss forward formula to evaluate y_{30}, where $y_{21} = 18.4704$, $y_{25} = 17.8144$, $y_{29} = 17.1070$, $y_{33} = 16.3432$, $y_{37} = 15.5154$.

5. (a) Find the maximum value of $f(x)$ from the following table :

x	-1	1	2	3
$f(x)$	7	5	19	51

(b) Find the value of $\log_e 2$ from $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson 1/3rd rule.

Section III

6. (a) Find the real root of equation $x^3 + x - 3 = 0$ using Regula-Falsi method.

(b) Find the order of convergence of Newton-Raphson method.

7. (a) Solve the following equations by Gauss-Jordan method :

$$2x + 3y - z = 5$$

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

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

(b) Solve the following equations by Jacobi's method :

$$10x + y + 2z = 44$$

$$2x + 10y + z = 51$$

$$x + 2y + 10z = 61.$$

Section IV

8. (a) Using Power method, find the Largest eigen value and the corresponding eigen vector of matrix :

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}.$$

(b) Transform the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ to tridiagonal form by HouseHolder method.

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9. (a) Given that $\frac{dy}{dx} = 2+\sqrt{xy}$ and $y(1) = 1$ find $y(2)$, taking $h = 0.2$ using Euler method.

(b) Solve $y' = y^2 + x$, $y(0) = 1$ using Taylor's series method and compute $y(0.1)$ and $y(0.2)$.