420061 **DCMT603**

Reg. No. | | | | | | | | |

VI Semester B.Sc. Degree Examination, July/August-2024

MATHEMATICS

Numerical Analysis

(NEP-2020 Scheme)

Paper : 6.2

Time : 2½ Hours **Maximum Marks : 60**

Instructions to Candidates:

Answer All questions.

I. Answer any SIX from the following questions. **(6×2=12)**

1. Define round off error.
2. Define transcendental equation and give an example.
3. Explain triangularization method.
4. Find largest eigen value of $\begin{pmatrix} 5 & 4 \\ 1 & 2 \end{pmatrix}$ by using power method up to 2 iterations.
5. Show that $\nabla = 1 - E^{-1}$, with usual notations.
6. Find the value of ∇y_5 from

x	1	2	3	4	5	6
y	1	8	27	64	125	216

7. Write the Newton's first order derivative formula by using forward interpolation for $y = f(x)$.
8. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal rule from the following data

x	0	1	2	3	4	5	6
y	1	0.5	0.2	0.1	0.0588	0.0385	0.027

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II. Answer any THREE from the following questions. **(3×4=12)**

9. If $x=\frac{1}{3}$ and its approximate value A=0.33333 then find, absolute, relative and percentage error.
10. Find a positive root of the equation x-cos$x$=0 in the interval (0,1) by using bisection method up to 4 stages correct to 3 decimal places.
11. Find a real root of the equation x-e^{-x}=0 by using secant method in the interval (0,1) up to 3 stages correct to 3 decimal places.
12. Find a real root of the equation $x^4 - x - 10 = 0$ where x lies between 1.8 and 2 by Regula -Falsi method up to 3 stages correct to 4 decimal places.
13. Find a real root of $x^3 - 10x - 5 = 0$; by Newton's Raphson method correct to 3 decimal places.

III. Answer any THREE from the following questions. **(3×4=12)**

14. Solve the system of equations by Gauss Elimination method x+4y+9z =16 ; 3x+2y+3z =18 ; 2x+y+z =10.
15. Solve the system of equations by Gauss Jordan method x+4y-2z =4; 3x+2y-4z =6; 4x+y+z =4
16. Solve by Gauss Jacobi iteration method 20x+y-2z=17; 3x+20y-z =-18; 2x-3y+20z =25 up to 4 stages.
17. Solve the system of equations by Gauss - seidel method 5x+2y+z =12; x+4y+5z=15; x+2y+5z =20; upto to 4 stages.
18. Find the largest eigen value and eigen vector of matrix

$$\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix} \text{ with } X_0 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$ upto 4 stages correct to 3 decimal places.

IV. Answer any THREE from the following questions. **(3×4=12)**

19. Show that

a) $\Delta - \nabla = \Delta.\nabla$

b) $\Delta \log x = \log\left(1+\frac{h}{x}\right)$

20. Estimate f(7.5) from the following data

x	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

21. Estimate the population in 1974 from the following data by Gauss backward formula

Year	1939	1949	1959	1969	1979	1989
Population (in lacks)	12	15	20	27	39	52

22. Apply lagrange's formula to find f(6) for the given data f(1) = 2 ; f(2) = 4; f(3) = 8 and f(7) = 128.

23. Find polynomial by using Newtons divided formula for following data

x	0	1	4	5
f(x)	8	11	68	123

V. Answer any THREE from the following questions. **(3×4=12)**

24. Derive first and second order derivatives using back ward formula for y = f(x).

25. Find $y'(0)$ *and* $y''(0)$ from the following data.

x	0	1	2	3	4	5
y	4	8	15	7	6	2

26. By using Simpson's $1/3^{rd}$ rule evaluate $\int_4^{5.2} \log_e x \, dx$ by taking h = 0.2.

27. By using Simpson's $3/8^{th}$ rule Evaluate $\int_0^{0.6} e^{-x^2} \, dx$ by taking 6 sub intervals.

28. Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using weddle's rule by taking n = 6.