

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted from the academic year 2019–20 & thereafter)

SUBJECT CODE: 19MT/ME/NM45

B. Sc. DEGREE EXAMINATION, APRIL 2023
BRANCH I – MATHEMATICS
SIXTH SEMESTER

COURSE : MAJOR ELECTIVE
PAPER : NUMERICAL METHODS WITH PROGRAMS IN C (THEORY)
TIME : 105 MINUTES **MAX. MARKS: 60**

SECTION-A

ANSWER ANY TEN QUESTIONS: **10 × 2 = 20**

1. Write down the condition for the convergence of Gauss-Seidel iteration scheme.
2. State the order of convergence and convergence condition for Newton's Raphson method.
3. Find the value of $Y(10)$ from the following data

X	5	6	9	11
Y	12	13	14	16

4. Form the difference table for:

X	10	15	20	25	30	35
Y	35.3	32.4	29.2	26.1	23.2	20.5

5. Write Newton's forward and Newton's Backward formula to find the derivatives

$$\left(\frac{dy}{dx}\right)_{x=x_0}, \left(\frac{d^2y}{dx^2}\right)_{x=x_0} \text{ and } \left(\frac{dy}{dx}\right)_{x=x_n}, \left(\frac{d^2y}{dx^2}\right)_{x=x_n}.$$

6. Find $y'(6)$ from the following data

X	0	2	3	4	7	9
Y	4	26	58	112	466	922

7. State Newton's-cote's quadrature formula.
8. When do you apply Simpson's 1/3rd rule and Simpson's 3/8th rule?
9. Compute $y(0.2)$, using Euler's method, $y' = x + y, y(0) = 1, h = 0.2$.
10. Write down the Runge-kutta formula fourth order to solve $y' = f(x, y)$ with $y(x_0) = y_0$.
11. Prove that $\nabla = 1 - E^{-1}$
12. What is the order of error in the Trapezoidal rule and Simpson's 1/3rd rule?

SECTION-B

ANSWER ANY FIVE QUESTIONS:

 $5 \times 8 = 40$

13. Solve the following system by Gauss-Seidel method correct to 2 places of decimals

$$10x - 5y - 2z = 3$$

$$4x - 10y + 3z = -3$$

$$x + 6y + 10z = -3$$

14. Find the value of Y when $X = 43$ and $X = 84$ from the following data.

X	40	50	60	70	80	90
Y	184	204	226	250	276	304

15. Find the first and second derivative of the function tabulated below at $x = 0.6$ using Stirling's formula:

X	0.4	0.5	0.6	0.7	0.8
Y	1.5836	1.7974	2.0442	2.3275	2.6511

16. Evaluate $\int_0^6 \frac{dx}{1+x}$ using Trapezoidal rule and Simpson's $1/3^{\text{rd}}$ rule by dividing the range into six equal parts.17. Compute $y(0.2)$ given $\frac{dy}{dx} + y + xy^2 = 0$, $y(0) = 1$ by Runge-Kutta fourth order by taking $h = 0.1$

18. Using Gauss's Backward interpolation formula find the population for the year 1936 given that

Year	1901	1911	1921	1931	1941	1951
Population in thousand	12	15	20	27	39	52

19. Find the positive root of $x - \cos x = 0$ by bisection method up to three places of decimals.

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BRANCH I – MATHEMATICS
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COURSE : MAJOR ELECTIVE
PAPER : NUMERICAL METHODS WITH PROGRAMS IN C (PRACTICAL)
TIME : 75 MINUTES **MAX. MARKS: 40**

SECTION-C

ANSWER ANY TWO QUESTIONS:

2×20 = 40

20. Write a C program to solve the following System of Linear Algebraic Equation by using Gauss-Jacobi method
- $$\begin{aligned}8x - 3y + 2z &= 20 \\4x + 11y - z &= 33 \\6x + 3y + 12z &= 35\end{aligned}$$
21. Write a C program to Evaluate numerically $\int_0^6 \frac{dx}{1+x^2}$ by dividing the range into six equal parts, using Trapezoidal and Simpson's rule.
22. Write a C program to Solve the Differential Equation $y' = -y$; $y(0) = 1$ and get $y(0.04)$, $h = 0.01$ by Euler's Method.

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