

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

B. Sc. DEGREE EXAMINATION, APRIL 2024
BRANCH I – MATHEMATICS
SIXTH SEMESTER

COURSE : MAJOR ELECTIVE
PAPER : NUMERICAL METHODS WITH PROGRAMS IN C (THEORY)
SUBJECT CODE : 19MT/ME/NM45
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-Jacobi iteration scheme.
2. State the order of convergence and convergence condition for Newton's Raphson method.
3. State Gauss's Backward Interpolation formula.

4. Find the missing term from the following table

X	0	1	2	3	4
Y	1	3	9	?	81

5. Write Newton's forward formula to find the derivatives $\left(\frac{dy}{dx}\right)_{x=x_0}$, $\left(\frac{d^2y}{dx^2}\right)_{x=x_0}$.

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

X	1	2	7	8
Y	1	5	5	4

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. State the Euler's formula to solve $y' = f(x, y)$ with $y(x_0) = y_0$.
10. Write down the Runge-kutta second order formula to solve $y' = f(x, y)$ with $y(x_0) = y_0$.
11. Distinguish between Interpolation and extrapolation.
12. What is the order of error in the Trapezoidal rule and Simpon's 1/3rd rule?

SECTION-B

ANSWER ANY FIVE QUESTIONS:

 $5 \times 8 = 40$

13. Solve the following system by Gauss-Seidel method

$$8x - 3y + 2z = 20$$

$$4x + 11y - z = 33$$

$$6x + 3y + 12z = 35$$

14. Using Gauss's forward interpolation formula find
- $f(32)$
- given that

x	25	30	35	40
$f(x)$	0.2707	0.3027	0.3386	0.3794

15. Find the first derivative of the function tabulated below at
- $x = 900$
- using Stirling's formula

X	0	300	600	900	1200	1500	1800
Y	135	149	157	183	201	205	193

16. Evaluate
- $\int_4^{5.2} \log_e x \, dx$
- using Trapezoidal rule, Simpson's
- $1/3^{\text{rd}}$
- rule, Simpson's
- $3/8^{\text{th}}$
- rule, by dividing the range into six equal parts.

17. Compute
- $y(0.2)$
- given
- $\frac{dy}{dx} = x + y$
- by Runge-Kutta fourth order by taking
- $h = 0.1, y(0) = 1$
- .

18. Using Lagrange's Interpolation formula, find
- $y(13.6)$
- from the following data

x	30	35	40	45	50
y	15.9	14.9	14.1	13.3	12.5

19. Find the positive root of
- $2x^3 - 3x - 6 = 0$
- by Newton-Raphson method.

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BRANCH I – MATHEMATICS
SIXTH SEMESTER

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 find the smallest positive root of the equation $x^3 - x + 1$ by using Bisection method.

21. Write a C program to interpolate the value of Y when X = 43 and X = 84 from the following data using Newton's Forward and Backward interpolation formula.

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

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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