



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

## B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIFTH SEMESTER – APRIL 2016

MT 5409 - NUMERICAL METHODS

Date: 29-04-2016  
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

### Part A

Answer ALL questions:

(10 x 2 = 20)

1. Explain Cramer's rule.
2. Establish the Newton-Raphson for  $\sqrt{N}$ , where  $N$  is a positive integer.
3. What do you mean by transcendental equation?
4. Write Newton forward interpolation formula..
5. Write any two properties of divided differences.
6. Write Stirling's formula using central difference notation.
7. Write the derivatives using Newton's forward difference formula.
8. Define numerical integration.
9. Write Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule.
10. Write the modified Euler's formula.

### Part B

Answer any FIVE questions:

(5 x 8 = 40)

11. Solve the following by Gauss elimination method.  
 $28x + 4y - z = 3$ ,  $x + 3y + 10z = 24$  and  $2x + 17y + 4z = 35$ .
12. Find the real root of  $x^3 - 9x + 1 = 0$  correct to three significant figures using Regula -falsi method.
13. Using Gauss forward formula find  $f(25)$  given

|        |    |    |    |    |
|--------|----|----|----|----|
| $x$    | 20 | 24 | 28 | 32 |
| $f(x)$ | 14 | 32 | 35 | 40 |

14. Find a cubic polynomial which takes the following set of values (0,1), (1,2), (2,1) and (3,10).
15. Derive Laplace Everett's formula.
16. Using the following data determine  $f'(5)$  by Newton's divided difference formula.

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

17. Apply Simpson's rule to evaluate  $\int_0^2 \frac{dx}{(1+x^3)}$  to two decimal places by dividing the range into 4 equal parts.
18. Solve  $\frac{dy}{dx} = 1 - y$  with the initial condition  $x = 0, y = 0$  using Euler's modified formula.

### Part C

Answer any TWO questions:

(2 x 20 = 40)

19. a) Solve by Gauss Seidel method:  $27x + 6y - z = 85$ ;  $6x + 15y + 2z = 72$ ;  $x + y + 54z = 110$ .

b) Find by Newton's method the root of the equation  $e^x = 4x$ , which is approximately 2, correct to three places of decimals.

(10+10)

20. a) Derive the Newton's backward difference interpolation formula.

b) By means of Lagrange's formula, prove that  $y_1 = y_3 - 0.3(y_5 - y_{-3}) + 0.2(y_3 - y_{-5})$ .

(10+10)

21. a) Use Stirling's formula to find  $f(1.63)$  given

|      |        |        |        |        |        |
|------|--------|--------|--------|--------|--------|
| x    | 1.5    | 1.6    | 1.7    | 1.8    | 1.9    |
| f(x) | 17.609 | 20.045 | 23.045 | 25.527 | 27.875 |

b) Using Bessel's formula, calculate  $y_5$  given

|   |     |     |     |     |
|---|-----|-----|-----|-----|
| X | 0   | 4   | 8   | 12  |
| Y | 143 | 158 | 177 | 199 |

(10+10)

22. a) Apply the fourth order Runge-Kutta method, to find an approximate value of  $y$  when  $x = 0.2$  given that  $y' = x + y, y(0) = 1$ .

b) Evaluate  $\int_0^{-10} \frac{dx}{1+x^2}$  by using Trapezoidal and Simpson's 3/8.

(10+10)

^^^^^^^^^^