



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034  
SEMESTER EXAMINATION – NOVEMBER 2015  
B.Sc. DEGREE EXAMINATION  
MT5409 – NUMERICAL METHODS

Date: 14/11 /2015  
Time: 9:00 – 12:00

Dept. No.

Max. : 100 Marks

SECTION – A

ANSWER ALL QUESTIONS:

(10 x 2 = 20)

1. Write Newton's formula to find a root of  $f(x) = 0$ .
2. State the condition for convergence in Newton Raphson Method.
3. What do you mean by transcendental equation?
4. Define Extrapolation.
5. What do you mean by partial pivoting?
6. Write Gauss Forward Interpolation formula.
7. Write Bessel's formula.
8. Define Numerical Differentiation.
9. Write the derivatives using Newton's backward difference formula.
10. Why Trapezoidal rule is said to have least accuracy?

SECTION – B

ANSWER ANY FIVE QUESTIONS:

(5 x 8 = 40)

11. Solve the system of equations  $10x + y + z = 12$ ,  $2x + 10y + z = 13$  and  $x + y + 5z = 7$  using Cramer's rule.
12. Solve the following system of equations by Gauss – Seidel method  
 $10x + 2y + z = 9$ ,  $x + 10y - z = -22$ ,  $-2x + 3y + 10z = 22$ .
13. Find a root of the equation  $x^3 - 3x + 1 = 0$  lying between 1 and 2 correct to three places of decimal by using bisection method.
14. Solve by Lagrange's formula to find the value of  $y$  at  $x = 6$  from the following data.

$x$	3	7	9	10
$y$	168	120	72	63

15. Use Stirling's formula to find  $y_{35}$  given that  $y_{10} = 600$ ,  $y_{20} = 512$ ,  $y_{30} = 439$ ,  $y_{40} = 346$ ,  $y_{50} = 243$ .
16. Apply Bessel's formula to obtain  $y_{25}$  given that  $y_{20} = 2854$ ,  $y_{24} = 3162$ ,  $y_{28} = 3544$ ,  $y_{32} = 3992$ .
17. Using Taylor's method solve  $\frac{dy}{dx} = 1 + xy$  with  $y_0 = 2$  and  $h = 0.1$ . Find  $y(0.1)$ .
18. Solve  $\frac{dy}{dx} = 1 - y$ ,  $y(0) = 0$  using Euler's method. Find  $y$  at  $x = 0.1$  and  $x = 0.2$ . Compare the results with the exact solution.

**SECTION – C**

**ANSWER ANY TWO QUESTIONS:**

**(2 x 20 = 40)**

19. (a) Solve the following system of equations using Gauss Elimination method.  $x + y + z = 9$ ,  $2x - 3y + 4z = 13$  and  $3x + 4y + 5z = 40$ .

(b) Find an iterative formula to find  $\sqrt{N}$ , where  $N$  is a positive number. **(15+5)**

20. (a) Find a real root of the equation  $x^3 - 2x - 5 = 0$  by the method of false position correct to three decimal places.

(b) Evaluate  $\int_0^{-10} \frac{dx}{1+x^2}$  using Trapezoidal rule. **(15+5)**

21. (a) The following data gives the melting point of an alloy of zinc and lead,  $\theta$  is the temperature and  $x$  is the percentage of lead. Using Newton's Interpolation formula find  $\theta$  (i) when  $x = 48$  (ii)  $\theta$  when  $x = 84$ .

$x$	40	50	60	70	80	90
$\theta$	184	204	226	250	276	304

**(20)**

22. (a) Given  $y' = x^2 - y$ ,  $y(0) = 1$ , find  $y(0.1)$ ,  $y(0.2)$  using Runge-Kutta methods of second order, third order and fourth order. **(20)**

\*\*\*\*\*