



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

## B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIFTH SEMESTER – NOVEMBER 2016

### MT 5409 - NUMERICAL METHODS

Date: 11-11-2016  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

#### Part A

Answer **ALL** the questions

(10 x 2 = 20)

1. Find  $x, y, z$  for the equations  $3x + y + 2z = 16$ ,  $2x - 6y + 8z = 24$  and  $5x + 4y - 3z = 2$
2. State the condition for convergence in Gauss Seidel method.
3. What do you mean by transcendental equation?
4. Find an iterative formula for  $x = \sqrt[n]{N}$ .
5. What do you mean by partial pivoting?
6. Construct the divided difference table for the following data.

$x$	4	5	7	10	11	13
$y$	48	100	294	900	1210	2028

7. Define Numerical Differentiation
8. Write Bessel's formula.
9. Distinguish between Simpson's  $1/3$  rule and Simpson's  $3/8$  rule.
10. Why Trapezoidal rule is said to have least accuracy?

#### Part B

Answer any **FIVE** questions

(5 x 8 = 40)

11. Solve by Cramer's rule  $2x - y + 2z = 2$ ,  $x + 10y - 3z = 5$  and  $x - y - z = 3$ .
12. Using Gauss elimination method solve  $3x + 4y - z = 8$ ,  $-2x + y + z = 3$  and  $x + 2y - z = 2$
13. Find the real root of the equation  $\cos x = 3x - 1$  correct to seven decimal places by the method of Successive approximation.
14. By Regula Falsi method solve  $x \log_{10} x = 1.2$  correct to four decimal places.
15. Find a cubic polynomial which takes the following set of value  $(0,1), (1,2), (2,1) \& (3,10)$
16. Use Laplace-Everett's formula to obtain  $f(1.15)$  given that  $f(1) = 1.000, f(1.10) = 1.049, f(1.20) = 1.096, f(1.30) = 1.140$ .
17. Using Gauss's forward interpolation formula, find the value of  $\log 337.5$  from the table:

$x$	310	320	330	340	350	360
$y_x = \log x$	2.4914	2.5051	2.5185	2.5315	2.5441	2.5563
18. Evaluate  $\int_0^2 y dx$  from the following table using Trapezoidal rule

$x$	0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0
$y$	1.21	1.37	1.46	1.59	1.67	2.31	2.91	3.83	4.01	4.79	5.31

### Part C

Answer Any **TWO** Questions.

(2 x 20 = 40)

19. (a) Find the root of the equation  $x^3 - x - 11 = 0$  correct to four decimal places by Bisection method.

(b) Solve  $x^3 - 3x^2 + 7x - 8 = 0$  by Newton – Raphson method.

20. (a) From the following data, estimate the number of persons having income in between 3500-4000.

Income	below500	500–1000	1000–2000	2000–3000	3000–4000
No.of persons	6000	4250	3600	1500	650

(b) Given  $\log_{10} 654 = 2.8156, \log_{10} 658 = 2.8182, \log_{10} 659 = 2.8189, \log_{10} 661 = 2.8202$ . Find by using Newton's Divided Difference formula, the value of  $\log_{10} 656$ .

21. Using Taylor's series method, solve  $\frac{dy}{dx} = x^2 - y, y(0) = 1$  at  $x = 0.1, 0.2, 0.3$  &  $0.4$ . Compare the values with the exact solution.

22. (a) Use Stirling's formula to find  $y_{35}$  given that  $y_{10} = 600, y_{20} = 512, y_{30} = 439, y_{40} = 346, y_{50} = 243$ .

(b) Apply Bessel's formula to obtain  $y_{25}$  given that  $y_{20} = 2854, y_{24} = 3162, y_{28} = 3544, y_{32} = 3992$ .