



# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

## B.Sc. DEGREE EXAMINATION – MATHEMATICS

FIFTH SEMESTER – APRIL 2017

### MT 5409- NUMERICAL METHODS

Date: 02-05-2017  
01:00-04:00

Dept. No.

Max. : 100 Marks

#### PART A

Answer ALL the questions.

(10 X 2 = 20)

1. Find  $\nabla$  for the equations  $10x + y + 2z = 12$ ,  $2x + 10y + z = 13$  and  $x + y + 5z = 7$ .
2. What is the condition to solve the system of linear equations using Gauss-Seidel method?
3. Find an iterative formula to find  $\sqrt[N]{N}$  where  $N$  is a positive number.
4. If the root of  $f(x) = 0$  lies between  $a$  and  $b$ , then what is the first approximation by the method of false-position method?
5. Define interpolation.
6. Construct a divided difference table for the following data.

$x$	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028
7. Write down the Bessel's formula.
8. To interpolate near the centre of the table, which formula can be used?
9. What is the iterative formula for Euler's method?
10. Write down the second order Runge-Kutta formula.

#### 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 Newton-Raphson method, find the root of the equation  $x \log_{10} x = 1.2$ .
13. Find a polynomial which takes the following values

$x$	1	3	5	7	9	11
$y$	3	14	19	21	23	28
14. Using Gauss's forward interpolation formula, find the value of  $\log 337.5$  from the following data.

$x$	310	320	330	340	350	360
$\log x$	2.4914	2.5051	2.5185	2.5315	2.5441	2.5563
15. Using Taylor series method, find the value of  $y(0.1)$  correct to four decimal places, given that  $\frac{dy}{dx} = x^2 - y$ ,  $y(0) = 1$ .
16. Solve the system of equations  $3x + y - z = 3$ ,  $2x - 8y + z = -5$  and  $x - 2y + 9z = 8$  using Gauss elimination method.
17. Use Stirlings' formula to find  $y_{35}$  given that  $y_{10} = 600$ ,  $y_{20} = 512$ ,  $y_{30} = 439$ ,  $y_{40} = 346$  and  $y_{50} = 243$ .
18. Estimate the value of  $f(42)$  from the following data.

$x$	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

**PART C**

**Answer any TWO questions.**

**(2 X 20 = 40)**

19. (a) Solve the equations  $28x + 4y - z = 32$ ,  $x + 3y + 10z = 24$  and  $2x + 17y + 4z = 35$  by Gauss-Seidel method correct to four decimal places.

(b) Find a root of the equation  $x^3 - x - 11 = 0$  correct to four decimal places using bisection method. **(10+10)**

20. (a) Using Newton's forward interpolation formula find the value of  $y$  when  $x = 9$ .

$x$	8	10	12	14	16
$y$	1000	1900	3250	5400	8950

(b) Use Lagrange's formula to find the form of  $f(x)$  for the following data. **(10+10)**

$x$	0	2	3	6
$f(x)$	648	704	729	792

21. (a) Interpolate by Gauss's backward formula, the sales of a concern for the year 1976.

Year	1940	1950	1960	1970	1980	1990
Sales (in lakhs)	17	20	27	32	36	38

(b) Use Laplace-Everett's formula to obtain  $f(1.15)$  given that  $f(1.00) = 1$ ,  $f(1.10) = 1.049$ ,  $f(1.20) = 1.096$ ,  $f(1.30) = 1.140$ . **(10+10)**

22. (a) Evaluate  $\int_0^{10} \frac{1}{1+x^2} dx$  using Trapezoidal rule, Simpson's one-third and three-eighth rules by dividing 10 equal intervals.

(b) Apply the third order Runge-Kutta method to find  $y(0.1)$  and  $y(0.2)$  given that  $y' = x^2 - y$ ,  $y(0) = 1$ .

**(10+10)**

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