



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – MATHEMATICS

SIXTH SEMESTER – APRIL 2017

MT 6605- NUMERICAL METHODS

Date: 24-04-2017
09:00-12:00

Dept. No.

Max. : 100 Marks

PART – A

Answer ALL questions:

(10x2=20 Marks)

1. What is the condition for convergence of Gauss-Seidel method of iteration?
2. When Gauss elimination method is used to solve $AX=B$, A is transferred in a _____ matrix.
3. State the convergence condition for Newton's Raphson method.
4. What is the condition for the convergence of the iterative method for solving $x = \phi(x)$?
5. Write the divided difference table for the data given below:

x:	1	2	7	8
y:	1	5	5	4
6. State Lagrange's interpolation formula
7. Write down the range for P for which Stirling's formula gives most accurate result.
8. Laplace – Everett formula involves _____ order differences.
9. State the Simpson's $\frac{3}{8}$ rule for numerical integration.
10. Write Taylor's series formula to solve $y' = f(x, y)$ with $y(x_0) = y_0$.

PART – B

Answer any FIVE questions:

(5x8=40 Marks)

11. Solve the system by Gauss – Elimination method
 $2x + 3y - z = 5, 4x + 4y - 3z = 3$ and $2x - 3y + 2z = 2$.
12. Solve for a positive root of $x - \cos x = 0$ by Regula Falsi method.
13. Find an iterative formula to find the reciprocal of a given number N and hence find the value of $\frac{1}{19}$.

14. Write a C program to interpolate Forward interpolation formula.

15. Using Lagrange's formula, prove

$$y_1 = y_3 - 0.3(y_5 - y_{-3}) + 0.2(y_{-3} - y_{-5}) \text{ nearly.}$$

16. Find the Value of $\cos 51^\circ 42'$ by using Gauss's backward interpolation formula from the table given below.

x:	50°	51°	52°	53°	54°
Cosx:	0.6428	0.6293	0.6157	0.6018	0.5878

17. Apply Simpson's $\frac{1}{3}$ rule to evaluate $\int_{0.5}^{0.7} \sqrt{x} e^{-x} dx$, dividing the range into 6 equal parts.

18. Using improved Euler method find y at x=0.1 and y at x=0.2 given

$$\frac{dy}{dx} + \frac{2x}{y} = y, y(0) = 1.$$

PART - C

Answer any TWO questions:

(2x20=40 Marks)

19. (a) Using Gauss – Seidel iteration method solve the system of equations

$$\begin{aligned} 10x_1 - 2x_2 - x_3 - x_4 &= 3, & -2x_1 + 10x_2 - x_3 - x_4 &= 15, \\ -x_1 - x_2 + 10x_3 - 2x_4 &= 27, & -x_1 - x_2 - 2x_3 + 10x_4 &= -9. \end{aligned}$$

Perform upto five iterations.

(b) Compute the real root of $x \log x = 1.2$ correct to three decimal places using Newton's – Raphson method. **(10+10)**

20. (a) Derive the Newton's divided difference formula

(b) In an examination the number of Candidates who obtained marks between certain limits were as follows

Marks	: 0-19	20-39	40-59	60-79	80-99
Number of Students	: 41	62	65	50	17

Estimate the number of candidates who obtained less than 70 marks

(8+12)

21. (a) From the following table, estimate $e^{0.644}$ correct to five decimal places
Using (i) Stirling's formula (ii) Everett's formula.

X :	0.61	0.62	0.63	0.64	0.65	0.66	0.67
e^x :	1.8404	1.8589	1.8776	1.8965	1.9155	1.9348	1.9542

(b) Find the value of Cos (1.74) from the following table.

X :	1.7	1.74	1.78	1.82	1.86
Sinx :	0.9916	0.9857	0.9781	0.9691	0.9584

22. (a) Write a C program to find the value $\int_a^b y dx$ using Simpson's $\frac{1}{3}$ rule.

(b) Using Runge – Kutta method of fourth order, solve for y at

$$x = 1.2 \text{ from } y' = \frac{2xy + e^x}{x^2 + xe^x} \text{ with } X_0=1, Y_0=0$$

(10+10)
