Q. Code:579349

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

MA22452 – NUMERICAL METHODS

(Chemical Engineering & Electrical and Electronics Engineering)

(Regulation 2022)

TIME: 3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Solve an algebraic, transcendental equations and linear system of equations using appropriate techniques.	**3**
CO 2	Appreciate the numerical techniques of interpolation in various intervals.	**3**
CO 3	Apply the numerical techniques of differentiation and integration for engineering problems.	**3**
CO 4	Solve Initial value problems using an appropriate numerical technique.	**3**
CO 5	Solve Boundary value problems using finite difference method.	**3**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What is the condition for convergence in Newton Raphson method?	**1**	**2**
2.	Show the Newton Raphson formula for $\sqrt{N}$ is $x_{n+1}=\frac{1}{2}\left(x_n+\frac{N}{x_n}\right), n=0,1,2,3\ldots$	**1**	**2**
3.	Define a diagonally dominant matrix.	**1**	**2**
4.	Find the largest eigenvalue of $\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$	**1**	**2**
5.	Using Lagrange's formula, fit a polynomial to the following data given below: x: 0, 1, 2 y: 0, 1, 20	**2**	**2**
6.	Find the divided differences for the following data: x: 1, 2, 4, 7 y: 22, 30, 82, 106	**2**	**2**
7.	Find the cubic polynomial which takes the values using Newton's forward interpolation formula x: 0, 1, 2, 3	**2**	**2**

$f(x)$	1	2	1	10

8.	Given f(0)= -2 ,f(1) = 2 and f(2) = 8 ,find the root of the Newton's interpolating Polynomial equation f(x) = 0.	**2**	**2**
9.	What is the order of the error in the trapezoidal rule and Simpson's 1/3rd rule ?	**3**	**2**
10.	Find the value of $\int_1^2 \frac{dx}{x}$ by Simpson's $\frac{1}{3}$rd rule by taking h = ¼ .Hence obtain the approximate value of $\log_e 2$.	**3**	**2**
11.	Why is Trapezoidal rule so called?	**3**	**2**
12.	How do you apply the Gaussian quadrature formula if the range not (-1, 1) ?	**3**	**2**
13.	What is the disadvantage in using the Taylor series method ?	**4**	**2**
14.	Using Taylor's series find y(0.1) correct to 2 decimal places if y(x) satisfies y'=x+y , y(0) =1	**4**	**2**
15.	Write the Milne's and Adam's Predictor-Corrector formulae.	**4**	**2**
16.	Given $y' = -y$ and y (0) =1, determine the values of y at x= 0.01 by Euler method .	**4**	**2**
17.	Write the diagonal and standard five point formulae for solving the Laplace equation	**5**	**2**
18.	Write down the Crank Nicholson formula to solve $u_{xx} = u_t$ in the general form. When does it assume its simplest form?	**5**	**2**
19.	What is the purpose of Liebmann's process ?	**5**	**2**
20.	Compare the method of explicit and implicit methods in numerical calculations.	**5**	**2**

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21. (a)	Solve the following system of equations using Gaussian elimination method: $x+2y+z=3, 2x+3y+3z=10, 3x-y+2z=13$	**(10)**	**1**	**3**

(OR)

(b) Solve using Gauss- Seidel method correct to three places of decimals **(10) 1 3**

$$27x+6y-z=85$$
$$x+y+54z=110$$
$$6x+15y+2z=72$$

22. (a) Find the values of y at $x=21 \wedge x=28$ from the following data **(10) 2 3**

x	20	23	26	29
y	0.3420	0.3907	0.4384	0.4848

(OR)

(b) Find $f(x)$ as a polynomial in'x' for the following data, by Newton's divided difference formula. **(10) 2 3**

x	-4	-1	0	2	5
f(x)	1245	33	5	9	1335

23. (a) **(10) 3 3**

Find the first two derivatives of $f(x)=(x)^{\frac{1}{3}}$ at x=50 and x=56 given in the table below :

x	50	51	52	53	54	55	56
y	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

(OR)

(b) **(10) 3 3**

Evaluate $\int_0^1 \int_0^1 \frac{dxdy}{1+x+y}$ using Simpson's 1/3rd rule and Trapezoidal Rule with step size $h=k=0.5$

24. (a) Using Runge-kutta method of fourth order **,** *Compute* $y(0.8)$ correct to 4 places of décimal if $\frac{dy}{dx}=y-x^2$ *given* $y(0.6)=1.7379$ **(10) 4 3**

(OR)

(b) Using $Adam's-Bashforth method$ find y(0.4) given **(10) 4 3**

$y'=\frac{xy}{2}$, y(0)=1, y(0.1)=1.01, y(0.2)=1.022, y(0.3)=1.023

25. (a) Solve the Poisson equation $\nabla^2 u=-10(x^2+y^2+10)$ over the square mesh with sides $x=0, x=3, y=0, y=3$ given $u=0$ on the boundary and mesh length is 1 unit. **(10) 5 3**

(OR)

		Marks	CO	RBT LEVEL
(b)	Solve using Bender-Schmidt method $u_{xx}=32u_t$ and $u(x,0)=0$, $u(0,t)=0, u(1,t)=t$ for $t\geq 0, 0<x<1$ by taking $h=0.25$ for 10 time steps.	**(10)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Using Gauss Jordan method to find the inverse of the following matrix:	**(10)**	**1**	**3**

$$\begin{pmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 3 & 1 \end{pmatrix}$$

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