Q. Code:796795

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

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

Fourth Semester

MA18451 – COMPUTAIONAL METHODS

(Common to CE/CH/EE/ME/MR branches)

(Regulation 2018 & 2018A)

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

CO 1 Apply numerical technique to solve algebraic and transcendental equations.

CO 2 Apply the knowledge and skills of numerical methods to do interpolation and approximation.

CO 3 Develops the skill to evaluate differentiation and integration numerically.

CO 4 Acquire the skill to solve ordinary differential equation numerically.

CO 5 Acquire the skill to solve partial differential equation numerically.

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		Marks	CO	RBT LEVEL
1	Find an iterative formula to find the Square root of positive integer N by Newton's Raphson method.	**2**	**1**	**2**
2	Distinguish between direct and iterative methods for solving a system of linear algebraic equations.	**2**	**1**	**1**
3	Find the third order divided difference $\frac{1}{x}$ for the arguments *a*, *b*, *c*, *d.*	**2**	**2**	**2**
4	State Newton's Forward and Backward Interpolation formula.	**2**	**2**	**1**
5	Find the value of $\int_1^2 \frac{dx}{x}$ by Simpson's 1/3 rule by taking h = ¼ .	**2**	**3**	**2**
6	Evaluate $\int_{-1}^{1} \frac{dx}{1+x^2}$ by Gaussian quadrature Two Point formula.	**2**	**3**	**2**
7	Find y at 0.1 for $\frac{dy}{dx}=\frac{1}{x+y},\ y(0)=0$ using Euler's method.	**2**	**4**	**2**
8	Write the Milne's Predictor and Corrector formula.	**2**	**4**	**1**
9	Classify the PDE $(x+1)f_{xx}+2(x+2)f_{xy}+(x+3)f_{yy}=0.$	**2**	**5**	**2**
10	Derive the finite difference formula for Poisson equation.	**2**	**5**	**2**

PART- B (5 x 14 = 70 Marks)
(Restrict to a maximum of TWO subdivisions)

			Marks	CO	RBT LEVEL
11(a)	(i)	Using Newton Raphson method to find an approximate root of the equations $xe^x - \cos x = 0$.	(7)	1	3
	(ii)	Using Power method find numerically largest Eigen value and Eigen vector of $\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$	(7)	1	3
		(OR)			
11(b)	(i)	Solve using Gauss Seidal method $27x+6y-z=85$, $x+y+54z=110$, $6x+15y+2z=72$	(7)	1	3
	(ii)	Solve using Gauss Elimination method $x+y+2z=4$, $3x+y-3z=-4$, $2x-3y-5z=-5$	(7)	1	3
12(a)	(i)	Find y (6) using Newton's divided difference method from the following data.	(7)	2	3

x	1	2	4	7
y	22	30	82	106

	(ii)	Find the values of y at x= 21 from the following data.	(7)	2	3

x	20	23	26	29
y	0.3420	0.3907	0.4384	0.4848

(OR)

12(b)	(i)	Use Lagrange's Interpolation formula, find y(1).	(7)	2	3

x	-1	0	2	3
y	-8	3	1	12

(ii) Using Newton's Backward interpolation formula, Estimate the population in the year 1996 **(7) 2 3**

X(years)	1961		1971	1981	1991	2001
Y(Population in lakh)	46		66	81	93	101

13(a) **(i)** Find the rate of growth of the population in the year 1971. **(7) 3 3**

x	1931	1941	1951	1961	1971
y	40.62	60.80	79.95	103.56	132.65

(ii) Using Trapezoidal rule and Simpson's rule, Evaluate **(7) 3 3**

$\int_0^{\pi} \sin x \, dx$ by dividing the range in to 10 equal parts.

(OR)

13(b) **(i)** $\int_0^1 \int_0^1 \frac{dxdy}{1+x+y}$ **(7) 3 3**

Using Simpson's 1/3 rule evaluate (taking h=k=0.5).

(ii) $\int_0^1 \frac{dx}{1+x^2}$ **(7) 3 3**

Evaluate the using Gaussian three point formula.

14(a) Using R.K. method of 4th order solve for y(0.1) given **(14) 4 3**

$y'' + x\,y' + y = 0,\ y(0) = 1,\ y'(0) = 0.$

(OR)

14(b) $\frac{dy}{dx} = xy + y^2,\ y(0) = 1$ **(14) 4 3**

Find y(0.1),y(0.2),y(0.3) from by using R-K 4th order and hence find y(0.4) using Milne's Method.

15(a) Solve the wave equation $u_{tt} = 4u_{xx}$ with boundary conditions **(14) 5 3**

$(i)\, u(0.t) = 0,\ (ii)\, u(4,t) = 0,\ (iii)\, u(x,0) = x(4-x),\ 0 \le x \le 4$

$(iv)\, u_t(x,0) = 0$ up to 6-time level by taking h=1.

(OR)

15(b)	Solve $\nabla^2 u = 8x^2y^2$ over the square mesh with sides $x=-2, x=2, y=-2, y=2$ given $u=0$ on the boundary and mesh length=1 unit.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16	Solve using Bender-Schmidt method $u_{xx} = u_t$ subject to u (0, t) =0, u (5, t) =0 and $u(x,0) = x^2(25-x^2)$ $0 \le x \le 5$, find the value of u up to t=6 seconds by taking h=1.	**(10)**	**5**	**3**

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