Register No : ___________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV/DEC 2025

Third Semester

Chemical Engineering

MA3356 / UMAT24303 – Differential Equations

Regulations – 2021 & 2024

Duration : 3 Hrs *Maximum : 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	Questions	BLT	CO	Marks
1.	Find the particular integral of $(D^2-2D+1)y=\cosh 2x.$	L2	1	2
2.	Solve $x^2\dfrac{d^2y}{dx^2}+x\dfrac{dy}{dx}=0.$	L2	1	2
3.	Form the partial differential equation by eliminating the arbitrary constants from $z=ax^2+by^2.$	L2	2	2
4.	Solve $(D^2-7DD'+6D'^2)z=0.$	L2	2	2
5.	State Adam's predictor and corrector formulae.	L1	3	2
6.	Write down the finite difference scheme for solving $y''+x+y=0; y(0)=y(1)=0.$	L1	3	2
7.	What is the error for solving Laplace and Poisson equations by finite difference method?	L1	4	2
8.	Write down the diagonal five point formula to solve the Laplace equation $u_{xx}+u_{yy}=0.$	L1	4	2
9.	Classify the partial differential equation $u_{xx}+2u_{xy}+4u_{yy}=0,\ x,y>0.$	L2	5	2
10.	State the explicit scheme formula for the solution of the wave equation.	L1	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)*

Q.No			Questions	BLT	CO	Marks
11.	a	i	Solve $(D^2+5D+4)y=2e^{-x}+e^{-x}\sin 2x.$	L3	1	8
		ii	Solve $(D^2+a^2)y=\sec ax$ using by method of variation of parameters.	L3	1	8
			Or			
	b	i	Solve $(x+1)^2y''+(x+1)y'+y=4\cos[\log(x+1)].$	L3	1	8
		ii	Solve $\dfrac{dx}{dt}+2y=-\sin t;\ \dfrac{dy}{dt}-2x=\cos t,\ x=1,\ y=0,\ t=0.$	L3	1	8
12.	a	i	Find the partial differential equation of all planes which are at a constant distance k from the origin.	L2	2	8
		ii	Find the singular solution of $z=px+qy+\sqrt{1+p^2+q^2}.$	L2	2	8
			Or			

	b i	Solve the equation $x(y-z)p+y(z-x)q=z(x-y)$.	L2	2	8
	ii	Solve $(D^3+D^2D'-4DD'^2-4D'^3)z=\cos(2x+y)$.	L2	2	8
13.	a	Using Adam's bashforth method find $y(4.4)$ given that $5xy'+y^2=2, y(4)=1, y(4.1)=1.0049,\ y(4.2)=1.0097$ *and* $y(4.3)=1.0413.$	L3	3	16
		Or			
	b	Solve the equation $y''-y=0$ with boundary conditions $y(0)=0$ and $y(1)=1.$	L3	3	16
14.	a	Solve the equation $\nabla^2 u=-10(x^2+y^2+10)$ over the square mesh with sides $x=0, y=0, x=3, y=3$ with $u=0$ on boundary with mesh length 1.	L3	4	16
		Or			
	b	Obtain a finite difference scheme to solve the Laplace equation $\nabla^2 u=0$ at the pivotal points in the square shown fitted with square mesh. Use Leibmann's iteration procedure.	L3	4	16

1000	1000	1000	1000
2000	u_1	u_2	500
2000	u_3	u_4	0
1000	500	0	0

15.	a	Solve the equation $\frac{\partial^2 u}{\partial x^2}=\frac{\partial^2 u}{\partial t^2}, 0<x<1, t>0$ satisfying the conditions $u(x,0)=0,\ \frac{\partial u}{\partial t}(x,0)=0, u(0,t)=0$ and $u(1,t)=\frac{1}{2}\sin\pi t$. Compute $u(x,t)$ for 4 time-steps by taking $h=\frac{1}{4}$.	L4	5	16
		Or			
	b	Solve by Crank-Nicolson's method $\frac{\partial^2 u}{\partial x^2}=\frac{\partial u}{\partial t},\ 0<x<1, t>0$ for given that $u(0,t)=u(1,t)=0$ and $u(x,0)=100x(1-x)$. Compute u for one time step with $h=\frac{1}{4}$ and $K=\frac{1}{64}$.	L4	5	16