Register No : ___________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Third Semester

Chemical Engineering

MA3356 – Differential Equations

Regulations - 2021

Duration : 3 Hrs *Maximum : 100 Marks*

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

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Solve: $\frac{d^2y}{dx^2}+5\frac{dy}{dx}+6y=0$.	UN	1	2
2.	Reduce the differential equation $(x^2D^2+4xD+2)y = x^2\cos(\log x)$ into that of constant coefficients.	UN	1	2
3.	Find the p.d.e. of all spheres whose centre lie on z-axis.	UN	2	2
4.	Solve $(D^4 - D'^4)z = 0$.	UN	2	2
5.	Define the Explicit Adams-Bashforth method.	RE	3	2
6.	What is a two-point boundary value problem?	RE	3	2
7.	Write the diagonal five point formula for solving the two dimensional Laplace equation $\nabla^2 u = 0$.	RE	4	2
8.	Using finite difference solve y''-y=0.	UN	4	2
9.	Write down the Bender-Schmidt formula to solve parabolic equation $\frac{\partial^2 u}{\partial x^2} = \alpha \frac{\partial u}{\partial t}$.	RE	5	2
10.	For what value of λ the explicit method of solving the hyperbolic equation $\frac{\partial^2 u}{\partial x^2} = \frac{1}{C^2}\frac{\partial^2 u}{\partial t^2}$ is stable, where $\lambda = \frac{C\nabla t}{\nabla x}$.	RE	5	2

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

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	Solve $(D^2-2D+1)\,y = (e^x+1)^2$.	AP	1	8
		ii	Solve $\frac{d^2y}{dx^2}+a^2y = \sec ax$ by method of variation of parameter.	AP	1	8
			Or			
	b	i	Solve $(x+1)^2y''+3(x+1)y'+y = \log(x+1)$.	AP	1	8
		ii	Solve $\frac{dx}{dt}+4x+3y=t, \frac{dy}{dt}+2x+5y=e^{2t}$.	AP	1	8
12.	a	i	Solve $z = px+qy+\sqrt{1+p^2+q^2}$.	AP	2	8
		ii	Solve $\left(D^2+4DD'-5D'^2\right)z = 3e^{2x-y}+\sin(x-2y)$.	AP	2	8
			Or			

	b	i	Solve $x^2(y-z)p+y^2(z-x)q=z^2(x-y)$.	AP	2	8
		ii	Solve $(D^3-7DD'^2-6D'^3)Z=x^2y+\sin(x+2y)$.	AP	2	8
13.	a	i	Find y(2) if y(x) is the solution of $\frac{dy}{dx}=\frac{1}{2}(x+y)$ given y(0)=2, y(0.5)=2.636, y(1)=3.595 and y(1.5)=4.968.	AP	3	8
		ii	Use Adam's method find y(0.4) given $\frac{dy}{dx}=\frac{1}{2}xy$, y(0)=1, y(0.1)=1.01, y(0.2)=1.022, y(0.3)=1.023.	AP	3	8
			Or			
	b		Solve $\frac{d^2y}{dx^2}+5\frac{dy}{dx}+6y=0$ with the initial condition y(0)=1 and y(1)=0 by orthogonal collocation method.	AP	3	16
14.	a		Solve $\nabla^2u=-10(x^2+y^2+10)$ over the square mesh with sides x=0, y=0, x=3, y=3 with u=0 on the boundary and mesh length l unit.	AP	4	16
			Or			
	b		Solve the equation $\nabla^2u=0$ for the following mesh, with boundary values as shown, using Leibmann's iteration procedure.	AP	4	16
15.	a	i	Solve $\frac{\partial^2u}{\partial x^2}=\frac{\partial u}{\partial t}$ given u(0,t)=0, u(4,t)=0, u(x,0)=x(4-x) assuming h=k=1. Find the values of u upto t=5 using Bender-Schmidt formula.	AP	5	8
		ii	Solve by Crank-Nicholson method the equation $u_{xx}=u_t$ subject to u(x,0)=0, u(0,t)=0 and u(1,t)=t, for two time steps.	AP	5	8
			Or			
	b		Solve numerically, $4u_{xx}=u_{tt}$ with the boundary conditions u(0,t)=0, u(4,t)=0 and the initial conditions $u_t(x,0)=0$ and $u(x,0)=x(4-x)$. taking h=1. (for 4 time steps).	AP	5	16