Register No : ____________________

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

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.	Find the particular integral of $(D^2 - 4D + 4)y = 2^x$.	L2	1	2
2.	Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 0$.	L2	1	2
3.	Form the partial differential equations by eliminating the arbitrary constants a & b from $z = ax + by + a^2 + b^2$.	L2	2	2
4.	Find the complete integral of $p - q = 0$.	L2	2	2
5.	State the formula for Predictor-Corrector method.	L1	3	2
6.	What is two-point linear boundary value problems?	L1	3	2
7.	State the standard five points formula of Laplace equation on a rectangular region.	L1	4	2
8.	Write Liebman's Iteration process.	L1	4	2
9.	State the implicit formula for the one-dimensional heat equation $\frac{\partial u}{\partial t} = C^2\frac{\partial^2 u}{\partial x^2}$	L1	5	2
10.	Find the Characteristic roots of the hyperbolic equation $\frac{\partial^2 u}{\partial t^2} = 2\frac{\partial^2 u}{\partial x^2} - 4$	L2	5	2

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

Q.No			Questions	BLT	CO	Marks
11.	a	i	Solve $(D^2 + 2D + 2)y = e^{-2x} + cos2x$.	L3	1	8
		ii	Solve $(D^2 + a^2)y = \tan ax$ by using the method of variation of parameters.	L3	1	8
			Or			
	b	i	Solve$[(x+1)^2D^2 + (x+1)D + 1]y = 4\cos[\log(x+1)]$.	L3	1	8
		ii	Solve the simultaneous linear differential equations	L3	1	8

$\frac{dx}{dt}+2y=-\sin t,\ \frac{dy}{dt}-2x=\cos t$ given $x=1$ and $y=0$ at $t=0$.

12.	a	i	Solve $z=px-qy+p^2-q^2$.	L3	2	8
		ii	Solve $(D^3-7DD'^2-6D'^3)z=sin(2x+y)+e^{3x+y}$.	L3	2	8
			Or			
	b	i	Solve $(mz-ny)p+(nx-lz)q=ly-mx$.	L3	2	8
		ii	Solve $(D^2+3DD'-4D'^2)z=x+siny$.	L3	2	8
13.	a	i	Use Adam's - Bashforth method, evaluate $y(1.4)$, if y satisfies $\frac{dy}{dx}+\frac{y}{x}=\frac{1}{x^2}$ and $y(1)=1,\ y(1.1)=0.996$, $y(1.2)=0.986\ and\ y(1.3)=0.972$	L3	3	8
		ii	Use the explicit Euler technique with $h=0.025$ to solve $\frac{dy}{dx}=-3y$; $y_0=1$ upto $t=0.25$. Compare with the exact value of 0.47237 at this point.	L3	3	8
			Or			
	b		Solve $(D^2+5D+6)y=0$ with initial condition $y(0)=1$ and $y(1)=0$ by Orthogonal Collocation method	L3	3	16
14.	a		Solve Poisson equation $u_{xx}+u_{yy}=-81xy;\ 0\le x\le 1,\ 0\le y\le 1$ given that $u(0,y)=0,\ u(x,0)=0,\ u(1,y)=100,\ u(x,1)=100$ and $h=\frac{1}{3}$.	L3	4	16
			Or			
	b		Solve the equation $\Delta^2 u=0$ for the following mesh, with boundary values as shown using Liebman's Iteration process.	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 boundary value problem, $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$, under the boundary conditions $u(0,t)=0=u(1,t)\ \ and\ u(x,0)=sin\pi x,\ 0\le x\le 1$, using Schmidt method ($Take\ \ h=0.2\ and\ \alpha=\frac{1}{2}$).	L3	5	16
			Or			
	b		Solve $\frac{\partial^2 y}{\partial t^2}=\frac{\partial^2 y}{\partial x^2}$ up to $t=0.5$ with spacing of 0.1 subject to $y(0,t)=0,\ y(1,t)=0,\ y_1(x,0)=0\ \ and\ \ y(x,0)=10+x(1-x)$.	L3	5	16