

QP CODE: D2BMT2403	(Pages: 2)	Reg. No :
		Name :
SECOND SEMESTER FYUGP EXAMINATION, APRIL 2025		
MAJOR COURSE		
MAT2MN101 : Differential Equations and Matrix Theory		
(Credits: 4)		
Time: 2 Hours	Maximum Marks: 70	
Section A		
Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)		
1. Solve the linear differential equation $y' = 2y + x^2 + 5$.	BL2	CO1
2. State the order of the given differential equation. Determine whether the equation is linear or non linear $\frac{d^2y}{dx^2} = \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$.	BL2	CO1
3. Solve $\frac{dy}{dx} = \sin 5x$.	BL2	CO1
4. Define Dimension of a vectorspace, Give an example of an infinite dimensional vector space.	BL2	CO1
5. Determine whether the set of all polynomials of degree 2 form a vectorspace, give reason.	BL2	CO1
6. Let A be a non zero 4×6 matrix. What is the maximum rank that A can have?	BL2	CO2
7. Find the eigen value of A^{-1} , $A = \begin{bmatrix} 4 & 0 \\ 2 & 3 \end{bmatrix}$.	BL2	CO2
8. Evaluate the determinant of the matrix $M = \begin{bmatrix} 1 - \lambda & 3 \\ 2 & 2 - \lambda \end{bmatrix}$.	BL2	CO2
9. Classify the given partial differential equation as hyperbolic, parabolic or elliptic. $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial y^2}$.	BL3	CO3
10. Define Fourier Cosine and Sine Series.	BL2	CO3
Section B		
Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)		
11. Solve the given initial value problem $y'' + 4y' = 0, y(0) = 0, y'(\pi) = 0$.	BL3	CO1
12. Solve $(2xy^2 - 3)dx + (2x^2y + 4)dy = 0$.	BL3	CO1
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13. Evaluate $\mathcal{L}\{\sin 2t\}$.	BL3	CO1
14. Use the Laplace transform to solve the initial value problem: $\frac{dy}{dx} + 3y = 13\sin 2t, y(0) = 6$	BL3	CO1
15. Use Gauss-Jordan elimination to solve $\begin{aligned} x_1 - x_2 - x_3 &= -3 \\ 2x_1 + 3x_2 + 5x_3 &= 7 \\ x_1 - 2x_2 + 3x_3 &= -11 \end{aligned}$	BL3	CO2
16. Solve the homogenous system $\begin{aligned} x_1 + x_2 + x_3 &= 0 \\ x_1 + x_2 + 3x_3 &= 0 \end{aligned}$	BL3	CO2
17. Expand $f(x) = \begin{cases} 0, & -\pi < x < 0 \\ x^2 & 0 \leq x < \pi \end{cases}$ in a Fourier series.	BL2	CO3
18. Use separation of variables to find product solutions of $\frac{\partial u}{\partial x} + 3\frac{\partial u}{\partial y} = 0$.	BL3	CO3
Section C		
Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)		
19. Find the eigen values and eigen vectors of $M = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 5 & 6 \\ 0 & 0 & -7 \end{bmatrix}$.	BL3	CO2
20. Solve the given initial value problem: (a) $x^2y'' + 3xy' = 0, y(1) = 0, y'(1) = 4$. (b) $x^2y'' + xy' + y = 0, y(1) = 1, y'(1) = 2$.	BL3	CO1
CO : Course Outcome		
BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)		