

QP CODE: D2BMT2502	(Pages: 2)	Reg. No :
		Name :

SECOND SEMESTER FYUGP EXAMINATION, APRIL 2026

(Regular/Improvement/Supplementary)

Discipline Specific Core (DSC) Courses - Minor

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.	State the order of the given differential equation. Determine whether the equation is linear or non linear $(1 - x)y'' - 4xy' + 5y = \cos x$.	BL2	CO1
2.	Solve $y'' + 16y = 0$.	BL2	CO1
3.	Define exact equations, Determine whether the given differential equation is exact $(x - y^3 + y^2 \sin x)dx = (3xy^2 + 2y \cos x)dy$.	BL2	CO1
4.	Define Basis of a vectorspace, Write the standard basis of R^n .	BL2	CO1
5.	Define linear independence, Determine the set $(1, 0, 0), (1, 1, 0), (1, 1, 1)$ linearly dependent or independent.	BL2	CO1
6.	Find the eigen values of $M = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 4 & 0 & 1 \end{bmatrix}$	BL2	CO2
7.	Verify that $x_1 = 14 + 7t, x_2 = 9 + 6t, x_3 = t$, where t is any real number is a solution of the system $2x_1 - 3x_2 + 4x_3 = 1, x_1 - x_2 - x_3 = 5$	BL2	CO2
8.	Evaluate the determinant of the matrix $M = \begin{bmatrix} 5 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ by cofactor expansion along third row.	BL2	CO2
9.	Classify the given partial differential equation as hyperbolic, parabolic or elliptic. $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial x \partial y} + \frac{\partial^2 u}{\partial y^2} = 0$	BL3	CO3
10.	Define even and odd function with examples.	BL2	CO3

(PTO)

Section B

Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

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| 11. | Solve $x^2 \frac{dy}{dx} = y - xy, y(-1) = -1$. | BL3 | CO1 |
| 12. | Solve $x^2 y'' + 3xy' = 0, y(1) = 0, y'(1) = 4$. | BL3 | CO1 |
| 13. | Evaluate $\mathcal{L}^{-1}\left\{\frac{s^2+1}{s(s-1)(s+1)(s-2)}\right\},$ | BL3 | CO1 |
| 14. | Evaluate $\mathcal{L}\{\cos 4t\}$. | BL3 | CO1 |
| 15. | Solve the homogenous system
$\begin{aligned} x_1 - x_2 - 2x_3 &= 0 \\ 2x_1 + 4x_2 + 5x_3 &= 0 \\ 6x_1 - 3x_3 &= 0 \end{aligned}$ | BL3 | CO2 |
| 16. | Define rank of a matrix, determine the rank of $M = \begin{bmatrix} 1 & -2 & 3 & 4 \\ 1 & 4 & 6 & 8 \\ 0 & 1 & 0 & 0 \\ 2 & 5 & 6 & 8 \end{bmatrix}$. | BL2 | CO2 |
| 17. | Expand $f(x) = x^2, -1 < x < 1$ in a Fourier series. | BL2 | CO3 |
| 18. | Use separation of variables to find product solutions of $x \frac{\partial u}{\partial x} = y \frac{\partial u}{\partial y}$. | BL3 | CO3 |

Section C

Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)

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| 19. | Find the eigen values and eigen vectors of $M^{-1}, M = \begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix}$. | BL3 | CO2 |
| 20. | Solve the initial value problem (a) $xy' + y = e^x, y(1) = 2$
(b) $y \frac{dx}{dy} - x = 2y^2, y(1) = 5$ | BL3 | CO1 |

CO : Course Outcome

BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)