

Q.P Code : D142006	Total Pages : 3	Name	760404
		Register No.	
SECOND SEMESTER (CUFYUGP) DEGREE EXAMINATION, APRIL 2026			
MATHEMATICS			
MAT2MN102 Calculus and Matrix Algebra			
2024 Admission Onwards			
Maximum Time :2 Hours		Maximum Marks :70	

Section A

All Question can be answered. Each Question carries 3 marks (Ceiling : 24 Marks)

1	Find $\int \frac{x^2}{1+x^2} dx$
2	Find $\int \frac{1}{1+3x^2} dx$
3	Suppose that a particle moves along a coordinate line so that its velocity at time t is $v(t) = 2t + \sin t$. Find the average velocity of the particle during the time interval $0 \leq t \leq \pi$.
4	Evaluate $\int_2^4 (3x-1)(x+1)^3 dx$
5	Find $\int \ln x dx$
6	Describe the level surfaces of $f(x, y, z) = x^2 + y^2 + z^2$
7	Explain the domain of $f(x, y) = \ln(1 - x^2 - y^2)$
8	For an $n \times m$ matrix $\mathbf{A}$, show that $(\mathbf{A}^T)^T = \mathbf{A}$
9	True or False: "For any $n \times n$ matrices $\mathbf{A}$ and $\mathbf{B}$, we get $(\mathbf{A} + \mathbf{B})^2 = \mathbf{A}^2 + 2\mathbf{AB} + \mathbf{B}^2$ ". Explain your answer
10	Find the eigenvalues and eigenvectors of the matrix $\begin{pmatrix} -1 & 2 \\ -7 & 8 \end{pmatrix}$

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Section B

All Question can be answered. Each Question carries 6 marks (Ceiling : 36 Marks))

11	Evaluate the integral $\int_1^4 \frac{ 2-x }{x} dx$
12	Using definite integral, find the area of the region under the curve $y = x^2 + 1$ and over the interval $[0, 3]$.
13	Find the area of the region that is enclosed between the curves $y = x^2$ and $y = x + 6$.
14	Evaluate $\int x^2 e^{-x} dx$
15	Determine whether the limit exists. If so, find its value. $\lim_{(x,y) \rightarrow (0,0)} \frac{1 - x^2 - y^2}{x^2 + y^2}$
16	If, $f(x, y, z) = z \ln(x^2 y \cos z)$, then find f_x, f_y and f_z
17	Solve the following system of linear equations $x_1 - x_2 - 2x_3 = 0$ $2x_1 + 4x_2 + 5x_3 = 0$ $6x_1 - 3x_3 = 0$
18	Construct an orthogonal matrix from the eigenvectors of the symmetric matrix $\begin{pmatrix} 1 & 9 \\ 9 & 1 \end{pmatrix}$

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Section C

Answer any ONE. Each Question carries 10 marks (1x10=10 Marks))

19

Evaluate the integral $\int_0^{10} \sqrt{10x - x^2} dx$ by completing the square and applying appropriate formulas from geometry.

20

Let $f(x, y, z) = y^2 e^{xz}$, find

1. $\left. \frac{\partial f}{\partial x} \right|_{(1,1,1)}$

2. $\left. \frac{\partial f}{\partial y} \right|_{(1,2,1)}$

3. $\left. \frac{\partial f}{\partial z} \right|_{(1,1,3)}$

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