H.T.No: | | | | | | | | | | | Course Code: **241MA001**

ADITYA UNIVERSITY

B.Tech – I Semester End Examinations Supplementary – APR 2025

LINEAR ALGEBRA AND CALCULUS

(Common to CE, EEE, ME, ECE, CSE, IT, Min.E, PT, CSE (DS) & AIML)

Time: 3 hours **Max. Marks: 50**

Answer ONE question from each unit
All Questions Carry Equal Marks
All parts of the questions must be answered at one place only

UNIT-I

1	a	Reduce the matrix A to its normal form, where $A=\begin{bmatrix}2&1&3&5\\4&2&1&3\\8&4&7&13\\8&4&-3&-1\end{bmatrix}$.	L2	CO1	[5M]
	b	Using the Gauss-Jordan method, find the inverse of the matrix $A=\begin{bmatrix}2&-1&3\\1&1&1\\1&-1&1\end{bmatrix}$.	L3	CO1	[5M]

(OR)

2		Apply the matrix method to solve the system of equations $x + 2y - z = 3$ $3x - y + 2z = 1$ $2x - 2y + 3z = 2$ $x - y + z = -1$	L3	CO1	[10M]

UNIT-II

3		Verify Cayley-Hamilton theorem for the matrix $A=\begin{bmatrix}1&2&3\\2&-1&3\\1&1&2\end{bmatrix}$.	L3	CO2	[10M]

(OR)

4		Determine the canonical form of the quadratic form $2x^2+2y^2+2z^2-2xy-2yz-2zx$ by using orthogonal transformation.	L3	CO2	[10M]

UNIT-III

5	a	Verify Cauchy's mean value theorem for $f(x)=e^x, g(x)=e^{-x}$ in [3, 7].	L3	CO3	[5M]
	b	Find the Taylor series for the function $x^4 + x - 2$ centered at $x = 1$.	L3	CO3	[5M]

(OR)

6	a	Evaluate $\lim\limits_{\substack{x\to 1\\ y\to 2}} \frac{x^2+2y}{x+y^2}$, $x \neq 0, y \neq 0$.	L2	CO3	[5M]

(P.T.O)

	b	If $u = 2x^2 + 3y^2$, then find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.	L2	CO3	[5M]

UNIT-IV

7	a	If $u = 3x + 2y - z, v = x - 2y + z, w = x + 2y - z$ show that they are functionally related.	L3	CO4	[5M]
	b	Find the maximum and minimum values of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$.	L3	CO4	[5M]

(OR)

8	a	If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \tan u$.	L3	CO4	[5M]
	b	Find the maximum and minimum distance of the point (3, 4, 12) from the Sphere $x^2 + y^2 + z^2 = 1$.	L3	CO4	[5M]

UNIT-V

9	a	By changing the order of integration, evaluate $\int_0^1 \int_1^{2-x} xy\, dy\, dx$.	L3	CO5	[5M]
	b	Evaluate $\iint r^3\, dr\, d\theta$ over the area included between the circle $r = 2\sin\theta$ and $r = 4\sin\theta$.	L3	CO5	[5M]

(OR)

10		Calculate the volume of the solid bounded by the surface $x = 0,\ y = 0,\ x + y + z = 1$ and $z = 0$.	L3	CO5	[10M]

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