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

ADITYA UNIVERSITY

B.Tech – I Semester End Examinations Supplementary – Mar 2026

LINEAR ALGEBRA AND CALCULUS

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

Time: 3 hours **Max. Marks: 100**

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	Find the rank of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ by reducing it to the echelon form.	L2	CO1	[10M]
	b	Solve 3x+2y+7z = 4; 2x+3y+z = 5; 3x+4y+z = 7,using Gauss elimination method.	L3	CO1	[10M]

(OR)

2	a	Find the inverse of the matrix $\begin{bmatrix} 2 & 0 & 3 \\ -1 & 3 & -4 \\ -3 & 1 & -4 \end{bmatrix}$,using Gauss-Jordan method.	L3	CO1	[10M]
	b	Solve the following Homogeneous system of equations $x+y-3z+2w=0$, $2x-y+2z-3w=0$, $3x-2y+z-w=0$, $-4x+y-3z+w=0$.	L3	CO1	[10M]

UNIT-II

3		Find the Eigen values and the corresponding Eigen vectors of the matrix A = $\begin{bmatrix} 2 & -3 & 0 \\ 2 & -5 & 0 \\ 0 & 0 & 3 \end{bmatrix}$.	L2	CO2	[20M]

(OR)

4		Reduce the quadratic form $3x^2+2y^2+3z^2-2xy-2yz$ to the normal form by orthogonal transformation.	L3	CO2	[20M]

UNIT-III

5	a	Verify Cauchy's mean value theorem for $(x)=sinx$ and $(x)=cosx$ on $[0, \frac{\pi}{2}]$.	L3	CO3	[10M]
	b	If $f(x,y) = 2x^2y^4 - \log_e x + \tan y$, then find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$.	L2	CO3	[10M]

(OR)

6	a	Using Maclaurin's series, show that $log(1+e^x) = log2 + x/2 + x^2/8 + - - -$	L3	CO3	[10M]

(P.T.O)

	b	Evaluate $\lim_{\substack{x\to 1\\ y\to 2}} \frac{x^2-y^2}{x-y}$.	L2	CO3	[10M]

UNIT-IV

7	a	Expand $tan^{-1}(\frac{y}{x})$ about the point (1, 1) using Taylor's theorem.	L3	CO4	[10M]
	b	Find the dimensions of the rectangular box, open at the top, of maximum capacity where surface is 432 sq.cm.	L3	CO4	[10M]

(OR)

8	a	If $u = x/y, v = y/x$then verify u, v are functionallyrelated are not? if so, find the relation.	L3	CO4	[10M]
	b	Determine the maxima and minima of $f(x, y) = x^2 + y^2 + 6x + 12$.	L3	CO4	[10M]

UNIT-V

9	a	Evaluate $\iint (x+y)dx\ dy$ over the region R bounded by $y = x^2$and $y=x$.	L2	CO5	[10M]
	b	Change the order of integration $\int_0^a \int_{\frac{x^2}{a}}^{2a-x} xy^2\, dy\, dx$ and hence evaluate.	L3	CO5	[10M]

(OR)

10	a	Evaluate $\iint r\ \sin\theta dr\ d\theta$ over the cardioid r=(1−$cos\theta$) above the initial line.	L3	CO5	[10M]
	b	Compute the double integral $\int_0^a \int_0^{\sqrt{a^2-y^2}} \left(x^2+y^2\right) dx\, dy$ by changing to polar coordinates.	L3	CO5	[10M]

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