Q.P.Code: 23HS0830	R23	H.T.No.										

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. I Year I Semester Regular & Supplementary Examinations December/January-2025/2026
LINEAR ALGEBRA & CALCULUS
(Common to All)

Time: 3 Hours **Max. Marks: 70**

PART-A

(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Define rank of the matrix.	CO1	L1	2M
	b	State Cauchy–Binet formulae.	CO1	L1	2M
	c	Find the Eigen Values of the matrix $A=\begin{bmatrix}1&3&4\\0&2&5\\0&0&3\end{bmatrix}$.	CO2	L3	2M
	d	Find the symmetric matrix corresponding to the quadratic form $ax^2+2hxy+by^2$.	CO2	L3	2M
	e	State Lagrange's mean value theorem.	CO3	L1	2M
	f	Expand Taylor's series of the function f(x) in powers of (x-a).	CO4	L2	2M
	g	Evaluate $\lim_{\substack{x\to 1\\ y\to 2}}\frac{2x^2y}{x^2+y^2+1}$.	CO5	L5	2M
	h	Define Extreme value of a function of two variables.	CO5	L1	2M
	i	Evaluate $\int_0^2\int_0^x y\,dydx$	CO6	L5	2M
	j	Find the area enclosed by the parabolas $x^2=y$ and $y^2=x$.	CO6	L1	2M

PART-B

(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2	a	Reduce the matrix $A=\begin{bmatrix}-2&-1&-3&-1\\1&2&3&-1\\1&0&1&1\\0&1&1&-1\end{bmatrix}$ into Echelon form and find its rank.	CO1	L3	5M
	b	Solve completely the system of equations $4x+2y+z+3w=0$; $6x+3y+4z+7w=0$; $2x+y+w=0$.	CO1	L3	5M
		OR			
3		Express the following system in matrix form and solve by Gauss elimination method. $2x_1+x_2+2x_3+x_4=6$; $6x_1-6x_2+6x_3+12x_4=36$; $4x_1+3x_2+3x_3-3x_4=-1$; $2x_1+2x_2-x_3+x_4=10$.	CO1	L2	10M

UNIT-II

4		Find the Eigen values and the corresponding Eigen vectors of the matrix $A=\begin{bmatrix}6&-2&2\\-2&3&-1\\2&-1&3\end{bmatrix}$.	CO2	L3	10M
		OR			
5		Reduce the quadratic form $2x^2+2y^2+2z^2-2xy-2yz-2zx$ in to the canonical form by an orthogonal transformation and discuss it's nature.	CO2	L3	10M

UNIT-III

6	a	Verify Rolle's theorem for the function $f(x)=\frac{\sin x}{e^x}$ in $[0,\pi]$.	CO3	L2	5M
	b	Verify Lagrange's mean value theorem for $f(x)=log_e x$ in $[1,e]$.	CO3	L2	5M
		OR			
7		Using Maclaurin's series expand $Tan\,x$ up to the fifth power of x and hence find the series for $\log(Sec\,x)$.	CO4	L3	10M

UNIT-IV

8	a	If $u=\log(x^3+y^3+z^3-3xyz)$ prove that $\left(\frac{\partial}{\partial x}+\frac{\partial}{\partial y}+\frac{\partial}{\partial z}\right)^2u=\frac{-9}{(x+y+z)^2}$.	CO5	L5	5M
	b	If $u=tan^{-1}\left[\frac{2xy}{x^2-y^2}\right]$ then prove that $\frac{\partial^2u}{\partial x^2}+\frac{\partial^2u}{\partial y^2}=0$.	CO5	L5	5M
		OR			
9		Examine the maxima and minima, if any of the function $f(x,y)=x^3y^2(1-x-y)$.	CO5	L4	10M

UNIT-V

10	a	Evaluate $\iint(x^2+y^2)\,dxdy$ in the positive quadrant for which $x+y\le 1$.	CO6	L5	5M
	b	Evaluate $\int_0^{\log 2}\int_0^x\int_0^{x+y}e^{x+y+z}\,dxdydz$.	CO6	L5	5M
		OR			
11	a	Find the area of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.	CO6	L1	5M
	b	Calculate the volume of the solid bounded by the planes $=0$, $y=0$, $x+y+z=a$ and $z=0$.	CO6	L1	5M

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