O.P.Code: 19HS0830	R19	H.T.No.									

12.06.2024

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech I Year I Semester Supplementary Examinations June-2024

ALGEBRA AND CALCULUS

(Common to all Branches)

Time: 3 Hours **Max. Marks: 60**

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	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 by using row transformations and find its rank.	CO1	L1	6M
	b	Solve completely the system of homogeneous equations $x+2y+3z=0,\ 3x+4y+4z=0,\ 7x+10y+12z=0$	CO1	L1	6M
		OR			
2		Reduce the Quadratic form $2x^2+2y^2+2z^2-2xy+2xz-2yz$ into the canonical form by Orthogonal transformation and discuss its nature.	CO1	L3	12M

UNIT-II

3	a	Verify Rolle's Theorem for the function $f(x)=\frac{\sin x}{e^x}$ in $(0,\pi)$	CO2	L4	6M
	b	Verify Cauchy's mean value theorem for $f(x)=e^x$ and $g(x)=e^{-x}$ in $[a, b]$	CO2	L5	6M
		OR			
4	a	Calculate the approximate value of $\sqrt{10}$ correct to **4** decimal places using Taylor's theorem	CO2	L5	6M
	b	Obtain the Maclaurin's series expression for the function $f(x)=\cos x$	CO2	L6	6M

UNIT-III

5	a	If $U=\log(x^3+y^3+z^3-3xyz)$ Prove that $\left(\frac{\partial}{\partial x}+\frac{\partial}{\partial y}+\frac{\partial}{\partial z}\right)^2 U=\frac{-9}{(x+y+z)^2}$.	CO3	L5	6M
	b	If $u=\frac{x+y}{1-xy}$ and $\theta=\tan^{-1}x+\tan^{-1}y$, then find $\frac{\partial(u,\theta)}{\partial(x,y)}$.	CO3	L1	6M
		OR			
6	a	Show that the functions $u=xy+yz+zx,\ v=x^2+y^2+z^2$ and $w=x+y+z$ are functionally related. Find the relation between them.	CO3	L1	6M
	b	By using Lagrange's undetermined multipliers, find the minimum value for $x^2+y^2+z^2$ subject to the condition $xyz=a^3$.	CO3	L3	6M

UNIT-IV

7	a	Evaluate $\int_0^{\pi}\sin^8\theta\cos^4\theta\,d\theta$	CO4	L5	6M
	b	Evaluate $\int_0^{\infty}\int_0^{\infty}e^{-(x^2+y^2)}\,dx\,dy$ by changing into polar coordinates.	CO4	L5	6M

OR

8	a	Evaluate $\iint xy(x+y)\,dx\,dy$ over the region R bounded by $y=x^2$ and $y=x$.	CO4	L5	6M
	b	Apply change of order of integration to evaluate $\int_0^{\infty}\int_x^{\infty}\frac{e^{-y}}{y}\,dydx$.	CO4	L3	6M

UNIT-V

9	a	Evaluate the integral $\int_0^1 x^2\left[\log\left(\frac{1}{x}\right)\right]^3\,dx$	CO5	L5	6M
	b	Prove that $\beta(m,n)=2\int_0^{\frac{\pi}{2}}\sin^{2m-1}\theta\cdot\cos^{2n-1}\theta\,d\theta$	CO5	L3	6M

OR

10	a	Prove that $\int_0^1\frac{x}{\sqrt{1-x^5}}\,dx=\frac{1}{5}\beta\left(\frac{2}{5},\frac{1}{2}\right)$	CO5	L3	6M
	b	Prove that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$	CO5	L3	6M

***** END *****