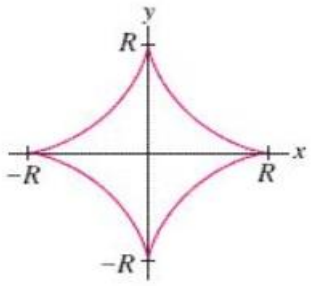
	Reg. No.:	
	Name :	

VIT BHOPAL
www.vitbhopal.ac.in

TERM END EXAMINATIONS (TEE) – December 2021- January 2022

Programme	:	**BTECH**	Semester	:	**Fall 2021-22**
Course	:	**Calculus and Laplace Transform**	Code	:	**MAT1001**
Faculty	:	**Dr. Yogesh Shukla**	Slot/ Class No.	:	**A21+A22+A23/BL20 21221000147**
Time	:	**1 ½ hours**	Max. Marks	:	**50**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART - A (30 Marks)	
1	(a)	If $x + y = 2e^{\theta}\cos\emptyset$, $x - y = 2ie^{\theta}\sin\emptyset$, Prove that $\frac{\partial^2 u}{\partial\theta^2} + \frac{\partial^2 u}{\partial\emptyset^2} = 4xy\frac{\partial^2 u}{\partial x\partial y}$	10
		OR	
	(b)	Given graph is representation of asteroid $x^{2/3} + y^{2/3} = a^{2/3}$  (A) Find the coordinate of given graph and also labelled the graph. (B) Find the total area of asteroid by integral calculus.	10
2	(a)	Verify divergence theorem for $\vec{F} = 4xz\hat{\imath} - y^2\hat{\jmath} + yz\hat{k}$ and S the surface of the cube bounded by the planes $x = 0, x = 2; y = 0, y = 2; z = 0, z = 2$.	10
		OR	
	(b)	Solve the following linear differential equation $xlogx\frac{dy}{dx} + 2y = 2logx$	10
3	(a)	Solve following Cauchy's Homogeneous Linear Differential equation: $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = \cos(\log x) + x\sin(\log x)$	10
		OR	

	(b)	Solve $y''- 4y'+4y=64 \sin 2t$ with y (0)=0, y'(0)=1 using Laplace transformation.	10
PART - B (20 Marks)			
4		If $u = f(x,y)\ , x = r\cos\theta\ , y = r\sin\theta\ , show\ that\ \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ Is transformed to the form $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r}\frac{\partial u}{\partial r} + \frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2} = 0$	10
5		Find the inverse Laplace transformation of $\frac{5s+3}{(s-1)(s^2+2s+5)}$	10
⇔⇔⇔			