

Reg. No.:

Name :



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

<b>Programme</b>	<b>: BTECH</b>	<b>Semester</b>	<b>: Fall 2021-22</b>
<b>Course</b>	<b>: Calculus and Laplace Transform</b>	<b>Code</b>	<b>: MAT1001</b>
<b>Faculty</b>	<b>: Dr. Yogesh Shukla</b>	<b>Slot/ Class No.</b>	<b>: D11+D12+D13/BL20 21221000491</b>
<b>Time</b>	<b>: 1 ½ hours</b>	<b>Max. Marks</b>	<b>: 50</b>

**Answer ALL the Questions**

Q. No.	Question Description	Marks
<b>PART - A ( 30 Marks)</b>		
1	(a) If $\theta = t^n e^{\frac{-r^2}{4t}}$ , where $\theta$ is dependent on t and r. Then find the value of n which makes $\frac{1}{r^2} \frac{\partial}{\partial r} \left( r^2 \frac{\partial \theta}{\partial r} \right) = \frac{\partial \theta}{\partial t}$	10
OR		
	(b) Find the volume of common area given in following graph which is bounded by the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$	10
2	(a) Verify Stoke's theorem for $\vec{F} = (x^2 + y^2)\hat{i} - 2xy\hat{j}$ taken round the reactangle bounded by the lines $x = \pm a, y = 0, y = b$ .	10
OR		
	(b) Identify the type of linear differential equations and solve $\frac{dy}{dx} = \frac{2x - 5y + 3}{2x + 4y - 6}$	10

3	(a)	Solve the following differential equation $\left(\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3y\right) = x^2 + \cos x$	10
OR			
	(b)	Using Laplace Transform, solve the ODE $y'' + 2y' + 5y = 3e^{-t} \sin t, \quad \text{if } y(0) = 0, y'(0) = 1$	10
<b>PART - B (20 Marks)</b>			
4	If $v = r^m, r^2 = x^2 + y^2 + z^2$ , then show that $v_{xx} + v_{yy} + v_{zz} = m(m+1)r^{m-2}$		10
5	Solve $(3x+2)^2 \frac{d^2y}{dx^2} + 3(3x+2) \frac{dy}{dx} - 36y = 3x^2 + 4x + 1$		10
$\Leftrightarrow \Leftrightarrow \Leftrightarrow$			