

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>: A11+A12+A13/BL20 21221000146</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 function $u = (1 - 2xy + y^2)^{-1/2}$ where u is dependent on x and y then prove that $\frac{\partial}{\partial x} \left\{ (1 - x^2) \frac{\partial u}{\partial x} \right\} + \frac{\partial}{\partial y} \left\{ y^2 \frac{\partial u}{\partial y} \right\} = 0$	10
OR		
	(b) Find the volume which is bounded by ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ As given in following figure : 	10
2	(a) Evaluate $\iint_S \vec{F} \cdot \hat{n} ds$ , where $\vec{F} = 18z\hat{i} - 12y\hat{j} + 3y\hat{k}$ and S is the surface of the plane $2x + 3y + 6z = 12$ in the first octant.	10
OR		
	(b) Solve the following linear differential equation $\frac{d^2y}{dx^2} + 2y = x^2e^{3x} + e^x \cos 2x$	10

3	(a) Using convolution theorem, evaluate the following $L^{-1} \left\{ \frac{s}{(s^2+1)(s^2+4)} \right\}$	10
OR		
	(b) Use Laplace transform methods to solve the following ODE $y'''(t) + 2y''(t) - y'(t) - 2y(t) = 0$ where given that $y(0) = 1, y'(0) = 2, y''(0) = 2$	10
<b>PART - B (20 Marks)</b>		
4	Change the order of integration in $\int_0^a \int_{\sqrt{a^2-x^2}}^{x+2a} dx dy$ , and evaluate the same.	10
5	Solve the following Cauchy's Homogeneous ordinary differential equation $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + 4y = x + x^2 \log x + x^3$	10
$\Leftrightarrow \Leftrightarrow \Leftrightarrow$		