	Reg. No.:	
	Name :	

VIT BHOPAL
www.vitbhopal.ac.in

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

Programme	:	**B.Tech-BAI, BAS, BCE, BCY, BCE, BEC, BSA, MEI**	**Semester**	:	**Fall 2021-22**
Course Name	:	**Calculus and Laplace Transforms**	**Course Code**	:	**MAT1001**
Faculty Name	:	**Dr. Suresh Dara**	**Slot / Class No**	:	**E21+E22+E23/BL20 21221000152**
Time	:	**1½ hours**	**Max. Marks**	:	**50**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART - A (30 Marks)	
1	(a)	A company manufactures a product at two different locations. The costs of manufacturing x_1 units at plant 1 and x_2 units at plant 2 are modeled by $C_1 = 0.03x_1^2 + 4x_1 + 300$ and $C_2 = 0.05x_2^2 + 7x_2 + 175$, respectively. If the product sells for 10 rupees per unit, find x_1 and x_2 such that the profit $P = 10(x_1 + x_2) - C_1 - C_2$, is maximized.	10
		OR	
	(b)	A cylindrical hole of radius a is bored through a sphere of radius b. Find the volume of the remaining solid.	10
2	(a)	If $\phi = \frac{3}{8}xyz$ find $\int_S \phi\, N\, dS$ where S is the surface of the cylinder $x^2 + y^2 = 16$ included in the first octant between $z = 0$ and $z = 5$.	10
		OR	
	(b)	Calculate the work done in a force field given by $\bar{A} = (2y + 3)\bar{\imath} + xy\bar{\jmath} + (yz - x)\bar{k}$ when an object is moved from the point $P_1(0,0,0)$ to $P_2(2,1,1)$ along the curve $x = 2t^2, y = t, z = t^3$.	10
3	(a)	Find the general solution of the following differential equation $(1 + x)^2 y'' + (1 + x)y' + y = 3x^2 + 4$	10
		OR	
	(b)	Find the inverse Laplace transform of $\frac{s + 2}{s^2(s + 3)}$	10

PART - B (20 Marks)		
4	Let $f(x,y) = \begin{cases} \frac{x^3-y^3}{x^3+y^3}, for\ f(x,y) \neq (0,0) \\ 15, \quad for\ f(x,y) = (0,0) \end{cases}$ Check the continuity at (1,1) and at the origin.	10
5	Find the general solution of the following differential equation $(D^2 - 3D + 2)y = e^{2x} \cosh x$	10
⇔⇔⇔		