	Reg. No.:	
	Name :	

VIT BHOPAL
www.vitbhopal.ac.in

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

Programme	**B.Tech**	**Semester**	**Fall 2021-2022**
Course Name	**Calculus and Laplace transforms**	**Course Code**	**MAT1001**
Faculty Name	**Dr. A.Manickam**	**Slot / Class No**	**A21+A22+A23/0164**
Time	**1½ hours**	**Max. Marks**	**50**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART - A – (3 x 10 = 30 Marks)	
1	(a)	Prove that the rectangular solid of maximum volume which is in inscribed in a sphere is a cube.	**10**
		OR	
	(b)	Evaluate $\iiint dzdydx$, where V is the finite region of space(tetrahedron) formed by the planes $x = 0, y = 0,$ $z = 0$ and $2x + 3y + 4z = 12$	**10**
2	(a)	Verify the Gauss divergence theorem for $\vec{F} = x^2\vec{i} + y^2\vec{j} + z^2\vec{k}$ over the cube bounded by $x = 0, x = a, y = 0, y = b, z = 0$ & $z = c$.	**10**
		OR	
	(b)	Find $\int_C \vec{F}.d\vec{r}$, if $\vec{F} = (3x^2 + 6y)\,\vec{i} - 14yz\,\vec{j} + 20xz^2\,\vec{k}$ moves a particle from (0,0,0) to the point (1,1,1) along $x = t, y = t^2, z = t^3$	**10**
3	(a)	Solve by using method of Cauchy's Legendre's linear differential Equations $(x+2)^2\frac{d^2y}{dx^2} - (x+2)\frac{dy}{dx} + y = 3x + 4$	**10**
		OR	

	(b)	(i). Find the Laplace Transform of the functions $\frac{e^{-2t} - e^{3t}}{t}$ (ii) Using Laplace transform to find the value of the definite integral for the following functions $\int_0^\infty e^{-2t} t \, cost \, dt$	**10**
Part - B – (2 x 10 = 20 Marks)			
4		(i). The temperature at a point (x, y, z) in space is given by $T(x, y, z) = x^2 + y^2 - z$. A mosquito located at $(4,4,2)$ desires to fly in such a direction that it gets cooled faster. Find the direction in which it should fly? (ii) In what direction from $(3,1,-2)$is the directional derivative of $\varphi = x^2y^2z^4$ maximum.	**10**
5		Solve $y'' - 3y' + 2y = 4e^{-t}$, given that $y(0) = 2, y'(0) = 3$, by using Laplace transform Techniques.	**10**
⇔⇔⇔			