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 Transform**	**Course Code**	**MAT1001**
Faculty Name	**Dr. Anant Kant Shukla**	**Slot / Class No**	**C11+C12+C13/BL2021221000132**
Time	**1½ hours**	**Max. Marks**	**50**

Answer ALL the Questions

Q. No.		Question Description	Marks
		PART - A – (3 x 10 = 30 Marks)	
1	(a)	Find the directional derivative of the scalar function $f(x,y) = x^2y^3 + xy - 5$, in the direction of a unit vector which makes an angle of 30° with the positive x −axis in the XY-palne.	10
		OR	
	(b)	Find the value of the double integral $\int_0^1 \int_{x^2}^{2-x} xy\, dy\, dx$, by changing the order of integration.	10
2	(a)	By using Gauss-Divergence theorem find the value of the surface integral $\iint_S \vec{F}.\vec{n}\, dS$, where $\vec{F} = [8x, -2y^2, z^2]$ and S is $x^2 + y^2 = 8, z = 0, z = 3$.	10
		OR	
	(b)	Solve the differential equation $y''(t) + y'(t) - 2y(t) = 1 - 2t, y(0) = 0, y'(0) = 4$ by using the Laplace transform.	10
3	(a)	Check whether the function e^{3x} is an integrating factor for the differential equation $(3x^2y + 2xy + y^3)dx + (x^2 + y^2)dy = 0$. If yes, then find the respective exact differential equation and its solution when $y(0) = 0$.	10
		OR	
	(b)	Let $f(t) = \begin{cases} 1, & 0 \le t < 1 \\ 2 - t, & 1 \le t \le 2 \end{cases}$ be a periodic function with period $T = 2$. Find the Laplace transform of $f(t)$.	10
		Part - B – (2 x 10 = 20 Marks)	
4		Evaluate the line integral $\int_C \vec{F}.d\vec{r}$, where $\vec{F} = [xy, x^2 + y^2]$ and C is the x-axis from $x = 2$ to $x = 4$ and the line from $y = 0$ to $y = 12$.	10
5		Find the solution of the differential equation $y''(x) + 8y'(x) + 16y(x) = 5e^{-4x}$ by the method of undetermined coefficients.	10

⟺✕✕⟺