Reg. No.:

Name :

VIT

Vellore Institute of Technology

Continuous Assessment Test (CAT)- II– May 2023

Programme	:	B.Tech.			
Course Title	:	Differential Equations and Transforms	Semester	:	Winter 2022-2023
			Code	:	BMAT102L
Faculty	:	Dr. Ankit Kumar, Dr. Kalyan Manna, Dr. Manimaran J, Dr. Manoj Kumar Singh, Dr. Nathiya N, Dr. Poulomi De, Dr. Prosenjit Paul	Slot	:	D2+TD2+TDD2
			Class Nbr	:	CH2022232300623, CH2022232300602, CH2022232300626, CH2022232300624, CH2022232300598, CH2022232300599, CH2022232300603
Duration	:	90 Minutes	Max. Marks	:	50

Answer all the Questions (5×10=50 marks)

Q.No.	Question Description	Marks
1.	Express the following function in terms of unit step functions and then find its Laplace transform: $f(t) = \begin{cases} 0, & t < 0 \\ -t, & 0 < t < 1 \\ 1, & 1 < t < 2 \\ 1+t, & t > 2 \end{cases}$.	[10]
2.	Find the inverse Laplace transforms of the followings: (a) $\frac{s+2}{s^2-3s+10}$; (b) $\frac{s^2}{(s^2+1)(2s+3)}$.	[5+5]
3.	Solve the following ODE by using the Laplace transform method: $y'' + y = u(t-2) + \delta(t-2)$ with $y(0) = 3$ and $y'(0) = 1$.	[10]
4.	Solve the following PDE by using the Laplace transform method: $\frac{\partial u}{\partial x} - 2\frac{\partial u}{\partial t} = 2x$ with $u(0,t) = 0$ and $u(x,0) = 0$, and $x > 0, t > 0$.	[10]
5.	Find the Fourier series expansion of the periodic function $f(x) = \begin{cases} 0, & -\frac{\pi}{2} < x < 0 \\ \cos x, & 0 \le x < \frac{\pi}{2} \end{cases}$ with period π in the interval $(-\frac{\pi}{2}, \frac{\pi}{2})$.	[10]

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