VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Winter Semester 2022-2023

Continuous Assessment Test – II

Programme Name: B.Tech

Slot: C2 + TC2

Course Name & code: Differential Equations & Transforms & BMAT102L

Exam Duration: 90 Min. **Maximum Marks:** 50

General instruction(s): Answer ALL Questions

Q.No.		Question	Max Marks
1.	(a)	Find the Laplace transform of the periodic function $f(t) = t^2$, $0 < t < 2$ and $f(t+2) = f(t)$ for $t > 2$.	5
	(b)	Using Laplace transform Evaluate $\int_0^\infty \frac{e^{-4t}\sin t}{t}\,dt$	5
2.		Find the inverse Laplace transform of $L^{-1}\left(\frac{1}{s^3(s^2+1)}\right)$ by using convolution theorem	10
3.		Solve the differential equation $\frac{d^2x}{dt^2} + x = t\left[1 - H(t-1)\right]$, with initial conditions $x(0) = x'(0) = 0$ by using Laplace transform.	10
4.		Solve by method of Laplace transforms, $\frac{\partial y}{\partial t} = \frac{\partial^2 y}{\partial x^2}$ and $y\left(\frac{\pi}{2}, t\right) = \left(\frac{\partial y}{\partial x}\right)_{x=0} = 0$; $y(x,0) = \cos 5x$	10
5.		Find the Fourier series for the given function $f(t) = \begin{cases} 0 & ; t = 0 \\ \frac{\pi - t}{2} & ; 0 < t < 2\pi \\ 0 & ; t = 2\pi \end{cases}$ and $f(t+2\pi) = f(t)$. Hence, deduce $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \ldots$	10