VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCE
WINTER SEMESTER 2022-2023

CONTINUOUS ASSESSMENT TEST - II

Programme Name & Branch: B. Tech
Course Code: BMAT102L
Course Name: Differential Equations and Transforms
Slot: A1+TA1
Date of the Examination: 07-05-2023
Duration: 90 minutes Max. Marks: 50

General instruction(s): Students are permitted to bring one text book/ hand written note book only.

ANSWER ALL THE QUESTIONS

Q. No	Question
1	Express the function $f(t)=\begin{cases} t\ , 0\le t<2 \\ 1,\ 2\le t<3 \\ (t-3)^3, t\ge 3 \end{cases}$ in terms of unit step function and hence find the Laplace transform of $f(t)$.
2	Find the inverse Laplace transform of $\frac{1}{(s^2+4)(s+2)}$ by using Convolution theorem.
3	Solve $x''(t)-x'(t)-2x(t)=2\sin t\,\delta(t-\pi)$ with $x(0)=1$ and $x'(0)=-1$, using Laplace transform.
4	Solve $\frac{\partial u}{\partial x}+x\frac{\partial u}{\partial t}=t$, $(x>0, t>0)$ with u(x,0)=0 (x > 0), u(0,t)=0 (t > 0), using Laplace transform.
5	Find the Fourier series of $f(t)=\frac{1}{12}\left(3t^2-6t\pi+2\pi^2\right)$ in the interval $(0, 2\pi)$. Hence deduce that $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\ldots\ldots\ldots=\frac{\pi^2}{6}$