VIT
Vellore Institute of Technology

School of Advanced Sciences
Department of Mathematics
WINTER SEMESTER 2023-2024
CONTINUOUS ASSESSMENT TEST – II

Course Code: BMAT102L
Course Name: Differential Equations and Transforms **Slot:** C1+TC1+TCC1
Duration: 90 Minutes **Answer all the Questions** **Max. Marks: 50**

General instruction(s):

Students are permitted to bring any number of text books and hand written note books (class notes)

Q. No	Question	Marks
1.	(a) Find the Laplace transform of the periodic function $f(t)$ of period $\frac{2\pi}{n}$, Where $f(t) = \begin{cases} 2, & in\ 0 < t < \frac{1}{2} \\ 0, & in\ \frac{1}{2} \le t < \frac{2\pi}{n} \end{cases}$ (b) Evaluate $\int_0^\infty \frac{e^{-3t}-e^{-6t}}{t}\,dt$, Using the Laplace transform.	5+5
2.	Using the convolution theorem, evaluate $L^{-1}\left\{\frac{s^2}{(s^2-a^2)(s^2+a^2)}\right\}$	10
3.	Solve the differential equation, $2\frac{d^2y}{dx^2} + 10y = 3H(t-12) - 5\delta(t-4)$, $y(0) = -1, \quad y'(0) = -2$.	10
4.	Obtain the Fourier series of period 2π given by $f(x) = \begin{cases} -\pi x - x^2 & -\pi < x < 0 \\ \pi x - x^2 & 0 < x < \pi \end{cases}$ and Deduce the sum of the series $\sum_{n=1}^{\infty} \frac{1}{n^2}$	10
5.	Find the half-range cosine series of the function $f(x) = 6x^2 - 6x + 1$, in $(0,1)$ and Deduce the sum of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^2}$	10