



VIIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test II - May 2023

Programme	: B.Tech.	Semester	: Win 2022-23
Course	: Differential Equations and Transforms	Code	: BMAT102L
Faculty	: Dr. Soumendu, Dr. Hannah, Dr. Radha, Dr. Abhishek, Dr. David, Dr. P. Vijay Kumar, Dr. Sowndarrajan	Slot	: A1+TA1+TAA1
Time	: 90 Minutes	Max.Marks	: 50

Answer ALL the questions

1. Find $L \left\{ t \int_0^\infty e^{-2t} t \cos 3t dt \right\}$. [05]

2. Find the Fourier series of the given function: [05]

$$f(x) = \begin{cases} \frac{\pi}{3} & 0 \leq x \leq \frac{\pi}{3} \\ 0 & \frac{\pi}{3} \leq x \leq \frac{2\pi}{3} \\ -\frac{\pi}{3} & \frac{2\pi}{3} \leq x \leq \pi \end{cases}$$

3. Using the Convolution theorem, find the inverse Laplace transform of $\frac{1}{(s^2 + 1)^3}$. [10]

4. Find the Fourier series expansion of $f(x) = \begin{cases} 0 & -\pi \leq x < a \\ 1 & a \leq x \leq b \\ 0 & b < x \leq 2\pi \end{cases}$. Hence, find the sum of [10]

the series for $x = 4\pi + a$ and deduce that

$$\sum_{n=1}^{\infty} \frac{\sin n(b-a)}{n} = \frac{\pi - b + a}{2}.$$

5. Solve the PDE $\frac{\partial y}{\partial x} - \frac{\partial y}{\partial t} = 0$, $y(x, 0) = e^{-2x}$, $y(0, t) = e^{-2t}$ using Laplace transform method. [10]

6. Solve $y'' + 3y' - 28y = u(t-2)$, $y(0) = 2$, $y'(0) = -3$. [10]

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$$\frac{s^2 - 7s + 48 + 2s}{s^2 - (s-7) + 4}$$