Continuous Assessment Test II - April 2024

Programme :	B.Tech.	Semester	:	Weekend Intra 2023-24
Course :	Differential Equations and Transforms	Code	:	BMAT102L
		Slot	:	X11+X12+X21+Z21
Faculty :	Dr. Sankarsan Tarai	Class ID	:	CH2023240503686
Time :	90 Minutes	Max.Marks :		50

Answer all the Questions

1. (a) Evaluate $L\left\{t \int_0^t \frac{e^{-t} sint}{t} dt\right\}$. [5]

   (b) Evaluate $L^{-1}\left\{\frac{1+2s}{(s+2)^2(s-1)^2}\right\}$. [5]

2. Solve $ty'' + 2y' + ty = sint$, when $y(0) = 1$. [10]

3. Find the Laplace transform of [10]

$$f(t) = \begin{cases} sint, & 0 \le t < \frac{\pi}{2} \\ cost - 3sint, & \frac{\pi}{2} \le t < \pi \\ 3cost, & t \ge \pi. \end{cases}$$

4. Find the Fourier series of the function [10]

$$f(x) = \begin{cases} 0, & \text{for } -\pi \le x \le 0 \\ sinx, & \text{for } 0 \le x \le \pi. \end{cases}$$

   Also show that $\frac{1}{1 \times 3} - \frac{1}{3 \times 5} + \frac{1}{5 \times 7} - \dots = \frac{\pi - 2}{4}$.

5. (a) Find the Fourier series of the function [10]

$$f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & \text{for } -\pi \le x \le 0 \\ 1 - \frac{2x}{\pi}, & \text{for } 0 \le x \le \pi. \end{cases}$$

   Also show that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.

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