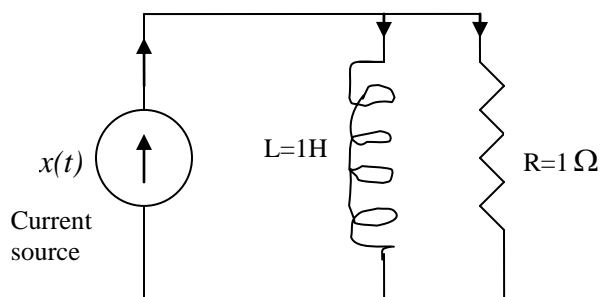


Signals and Systems (CT 203)

Tutorial Sheet-08

DA-IICT, Gandhinagar.

Problem 1:- Consider a causal LTI system implemented as the RL circuit shown in figure below. A current source produces an input current $x(t)$, and the system output is considered to be the current $y(t)$ flowing through the inductor,



- (a) Find the differential equations relating $x(t)$ and $y(t)$.
- (b) Determine the frequency response of this system by considering the output of the system to input of the form $x(t) = e^{j\omega t}$.
- (c) Determine the output $y(t)$ if $x(t) = \cos(t)$.

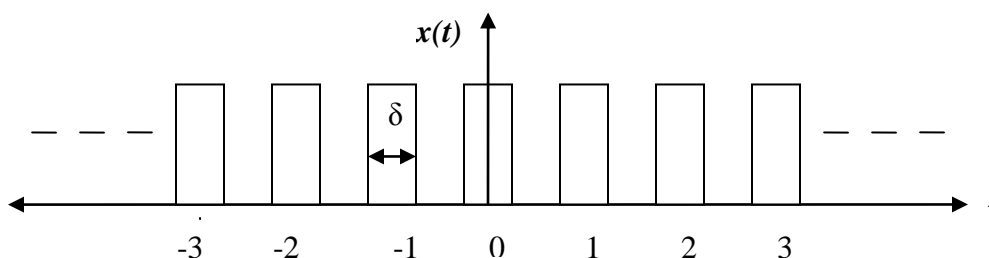
Problem 2:- Consider a continuous time LTI system with impulse response $h(t) = e^{-4|t|}$.

Find the Fourier series representation of the output $y(t)$ for each of the following inputs:-

(a) $x(t) = \sum_{n=-\infty}^{+\infty} \delta(t-n)$

(b) $x(t) = \sum_{n=-\infty}^{+\infty} (-1)^n \delta(t-n)$

- (c) $x(t)$ is the periodic wave depicted in the figure below. Pulse width is $\delta = \frac{1}{2}$ and pulse height is 1.



3. Consider a continuous-time LTI system whose frequency response is

$$H(j\omega) = \int_{-\infty}^{+\infty} h(t)e^{-j\omega t} dt = \frac{\sin(4\omega)}{\omega}$$

If the input to this LTI system is a periodic signal

$$f(t) = \begin{cases} 1, & 0 \leq t < 4 \\ -1, & 4 \leq t < 8 \end{cases}$$

With period $T=8$, determine the corresponding system output.