ELEC2040 PRACTICAL WORK Week 8

Laplace Transform Properties

(9.31 OW 729)

The input $x(t)$ and output $y(t)$ of a continuous-time LTI system are related by

$$\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$$

Determine $H(s)$, the Laplace transform of the impulse response $h(t)$ and sketch a pole-zero plot of $H(s)$.

Determine $h(t)$ in each of the following three cases:

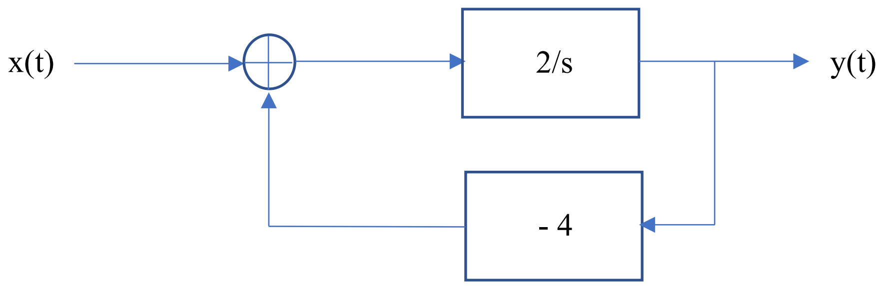
(a) the system is stable,

(b) the system is causal and

(c) the system is neither stable nor causal.

Question A

a) What is the transfer function for the following signal block diagram?
b) What is the impulse response for this system?



(Schaums Q3.25)

The output *y(t)* of a continuous time LTI system is found to be $2e^{-3t}u(t)$ when the input *x(t)* is the unit step *u(t)*.

a) Find the impulse response *h(t)* of the system
b) Find the output *y(t)* when the input *x(t)* is $e^{-t}u(t)$

(Schaums Q3.30)

Consider a continuous time LTI system for which the input *x(t)* and output *y(t)* are related by

$$y''(t) + y'(t) - 2y(t) = x(t)$$

a) Find the system function *H(s)*
b) Determine the impulse response h(t) for each of the following three cases:
   (i) the system is causal,
   (ii) the system is stable,
   (iii) the system is neither causal nor stable.

Qu B

A signal has a Laplace transform

$$X(s) = \frac{10(s+1)}{(s+3)(s^2+2s+2)} \quad , \quad \Re\{s\} > -1$$

Determine the magnitude and phase of the Fourier transform $X(j\omega)$ at the frequency $\omega = 2$ rad/sec.