Course Details

Course Title: Signal & System

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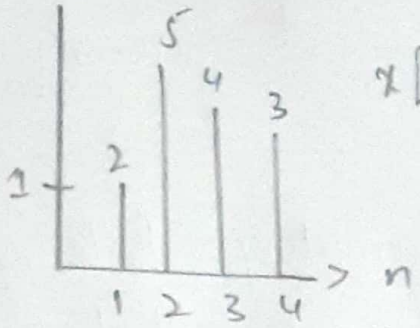
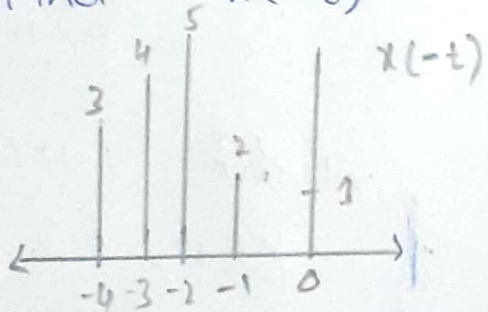
Q1 Evaluate the even and odd for the given function.



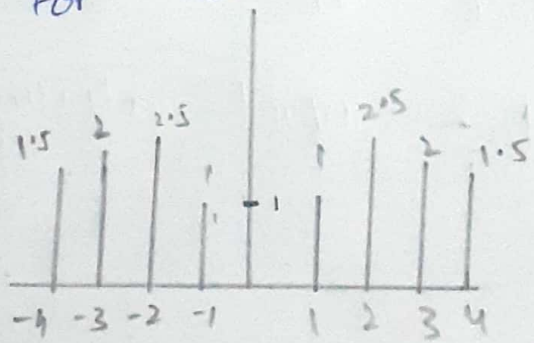
Even $\rightarrow x_e(t) = \frac{x(t)+x(-t)}{2} = \frac{1}{2}[x(t)+x(-t)]$

Odd $\rightarrow x_o(t) = \frac{x(t)-x(-t)}{2} = \frac{1}{2}[x(t)-x(-t)]$

Find $x(-t)$

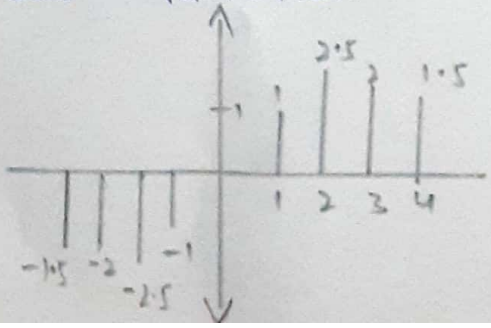


Now For Even Function is



-> This is for even function.

And Now for odd function



This is for odd function

Both even and odd the amplitude is half

The given signal because it divide by. (2) two.

Q2 Calculate the inverse laplace transform given equation.

$$Y(s) = \frac{s+4}{s^2+4s-12}$$

Solution:

$$Y(s) = \frac{s+4}{s^2+4s-12}$$

$$Y(s) = \frac{s+4}{s^2-2s+6s-12}$$

$$\Rightarrow \frac{s+4}{s(s-2)+6(s-2)}$$

$$Y(s) \Rightarrow \frac{s+4}{(s-2)(s+6)}$$

Partial fraction expression is

$$\frac{s+4}{(s-2)(s+6)} = \frac{A}{s-2} + \frac{B}{s+6}$$

(Xing) Multiplying Both side by $(s-2)(s+6)$

$$(s-2)(s+6) \times \frac{s+4}{(s-2)(s+6)} = (s-2)(s+6) \times \frac{A}{s-2} + (s-2)(s+6) \times \frac{B}{s+6}$$

$$s+4 = A(s+6) + B(s-2)$$

Find

$$s+4 = A(s+6) + (s-2)B$$

IF $s = 2$ so

$2+4 = A(2+6) + (2-2)B$

$6 = 8A + (0)B \Rightarrow B = 8A$

$A = \frac{6}{8} \Rightarrow \boxed{A = \frac{3}{4}}$

17 $S = -6$

$S+4 = A(S+6) + (S-2)B$

$-6+4 = A(-6+6) + (-6-2)B$

$-2 = A(0) + (-8)B$

$-2 = -8B \Rightarrow B = \frac{-2}{-8}$

$\boxed{B = \frac{1}{4}}$

$Y(s) = \frac{3/4}{S-2} + \frac{1/4}{S+6}$

$L^{-1}(Y) = \frac{3}{4} L^{-1}\left(\frac{1}{S-2}\right) + \frac{1}{4} L^{-1}\left(\frac{1}{S+6}\right)$

$\boxed{L^{-1}(Y) = \frac{3}{4} e^{2t} + \frac{1}{4} e^{6t}}$

Q3 Part (A)

Discuss the procedure of converting an analog signal into a digital one.

Ans Analog signal is converted to digital signal using a two step process.

(1) sampling
(2) Quantization

The device used to do this is called ADC (Analog to Digital converter).

Sampling:-

convert a continous time continous amplitude (real valued) signal to discrete time continous amplitude (still real valued) signal. Remember only time axis is discretized and not the amplitude axis

Quantization:

it is convert discrete time continous amplitude signal to discrete time and discrete valued (from a set of finite values, so that it can be represented by finite bits & can be stored on a computer).

Q3 Part (b)

Suppose an analog has a highest frequency 60 Hz. -- -- -- aliasing occurs.

The Nyquist sampling Rate is the lowest sampling rate that can be used without having aliasing. The Sampling rate for an analog signal must be at least two time the bandwidth of the signal. So for the example, an audio signal ~~with~~ with a band width of 60Hz must be sampled at least at 120 HZ to avoid aliasing.

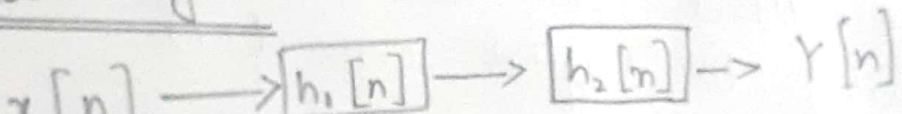
Q4 Show that
$x[n] * [h_1[n] * h_2[n]] = [x[n] * h_1[n]] * h_2[n]$

As we are given:-
$x[n] * [h_1[n] * h_2[n]] = [x[n] * h_1[n]] * h_2[n]$

Consider
$Y[n] = [x[n] * h_1[n]] * h_2[n]$
$x[n] * h_2[n] = w_1[n]$

And Now:
$Y_1[n] = [x[n] * h_1[n]] * h_2[n]$
$Y[n] = w_1[n] * h_2[n]$

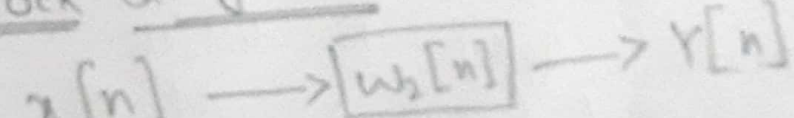
Block diagram



Now we consider that:-
$w_2[n] = h_1[n] * h_2[n]$
$Y_1[n] = x[n] * [h_1[n] * h_2[n]]$
$Y[n] = x[n] * w_2[n]$

~~x[n]~~

Block diagram



In the R.H.S block diagram and the L.H.S block diagram both are given the same response so

L.H.S = R.H.S

Hence both are proved.