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Subject Signal and System

Semester 10th

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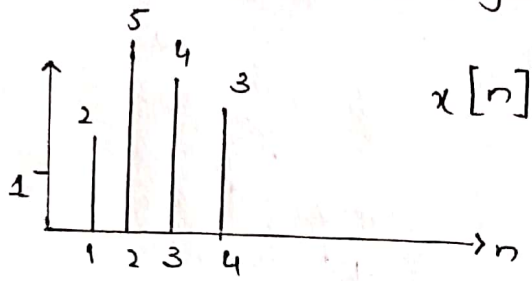
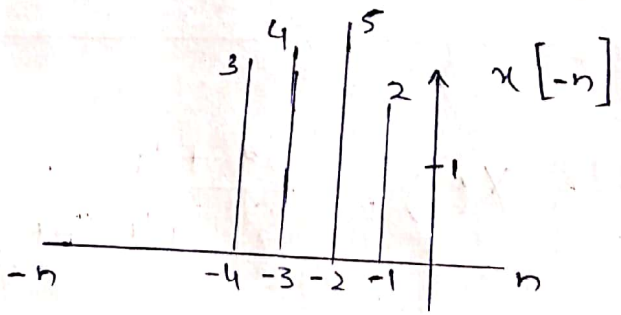
Q: 1 Evalute the even andd odd components for the given funtion.

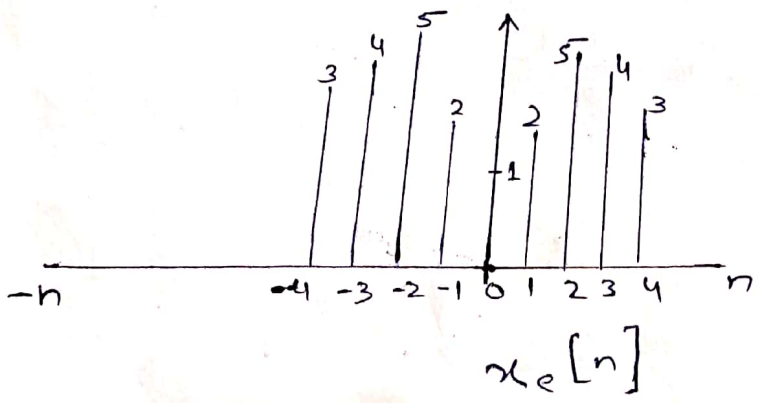


Solution:- As we know that even components of a function can be written

$$x_e[n] = \frac{x[n] + x[-n]}{2}$$

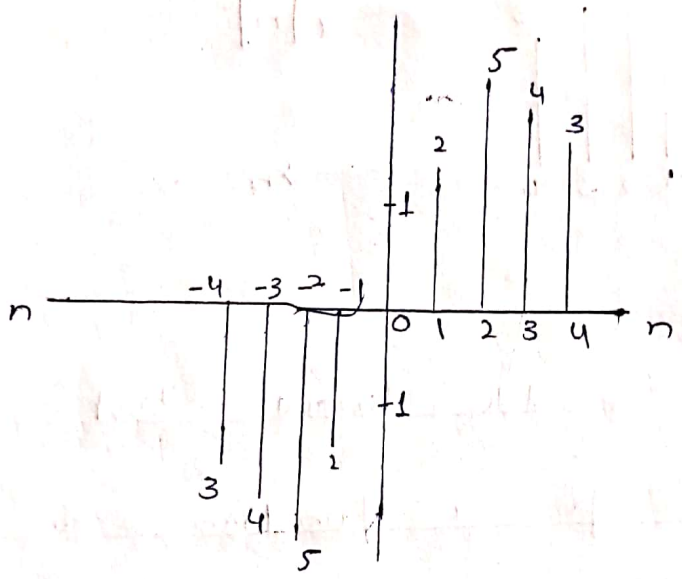
Reflect $x[n]$ to get $x[-n]$





odd components can be written as

$$x_o[n] = \frac{x[n] - x[-n]}{2}$$



Q:2 Calculate the inverse laplace transform of the given equation:

$$Y(s) = \frac{5s + 4}{s^2 + 4s - 12}$$

Solution:- $\frac{S+4}{S^2+4S-12}$

$$\frac{S+4}{S^2+4S-12}$$

$$\frac{S+4}{S^2+6S-2S-12}$$

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

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

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

Multiply both side by $(S-2)(S+6)$

or taking L.C.M B.Sides

$$Y(s) = S+4 = A(s+6) + B(S-2) \rightarrow (1)$$

Let $S = -6$ in eq ①

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

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

$$-2 = B(-8) \Rightarrow B = \frac{+2}{+8} = 4$$

$$\boxed{B = 4}$$

Now,

$S = 2$ in eq ①

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

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

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

$$6 = A(8)$$

$$A = {}^{2}\cancel{6}/\cancel{8}_{4} \Rightarrow \frac{1}{4_2} = 1/2$$

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

$$= 1/2\,L^{-1}(1/s-2) + 4L^{-1}(1/s+6)$$

$$= 1/2\,e^{2t} + 4e^{-6t}$$

Q 3(A) Discuss procedure of converting an analog signal into a digital one.

Ans An analog-to-digital converter, or ADC as it is more commonly called, is a device that converts analog signal into digital. Analog information is transmitted by modulating a continous transmittion signal by amplifing a signal's strength or varrying its frequency to add or take away data. Digital information describes any system based on discontinous data or events. Computer which handle data in digital form, requrie analog to digital converter to turn signals from analog to digital before it can be read. One example is Modem which turn signals from digital to analoge

before transmitting Those signals over communication lines such as telephone lines that carry only analog signals. The signal are turned back into digital form (demodulated) at the recieving end so that computer can process data in its digital format.

P.3b Suppose an analoge signal has a highest frequency of 60Hz. Outline the steps that will measure that no alliasing occurs.

Ans $f = 60Hz$

ensure that there is no alliasing occur.

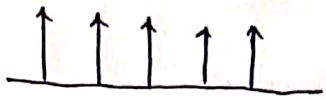
$f = 60Hz$

From Niquist Criteria

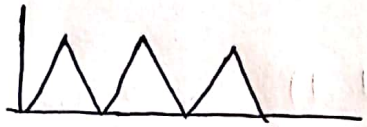
$f_s \geq 2 f_m$

$f_s \geq 2 \times 60$

$f_s = 120$



f_m



$f_s \quad f_s \quad f_s \quad f_s$

if $f_s = 120Hz$ there will be no alliasing occurs as Niquist criteria prove that.

Q:-4 Show that :-

$$x[n] * [h_1[n] * h_2[n]] = [x[n] * h_1[n]] * h_2[n]$$

Ans

$$x[n] * [h_1[n] * h_2[n] = [x[n] * h_1[n]] * h_2[n]$$

Consider

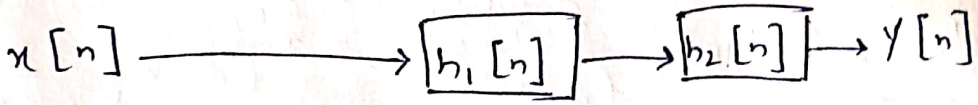
$$y[n] = [x[n] * h_1[n]] * h_2[n]$$

$$x[n] * h[n] = w_1[n]$$

Now

$$y[n] = [h[n] * h_1[n] * h_2[n]$$

$$y[n] = w_1[n] * h_2[n]$$

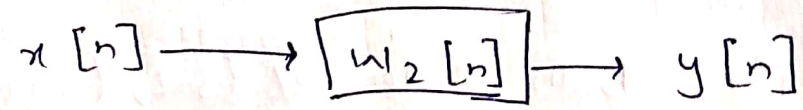


Now consider that

$$w_2[n] = h_1[n] * h_2[n]$$

$$y[n] = x[n] * [h_1[n] * h_2[n]]$$

$$y[n] = x[n] * w_2[n]$$



Both the block diagram give us the same responce we can write as:

$$x[n] * [h_1[n] * h_2[n] = [x[n] * h_1[n] * h_2[n]$$