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Subject : S & S

Instructor : Engr. Mujtaba Ehsan

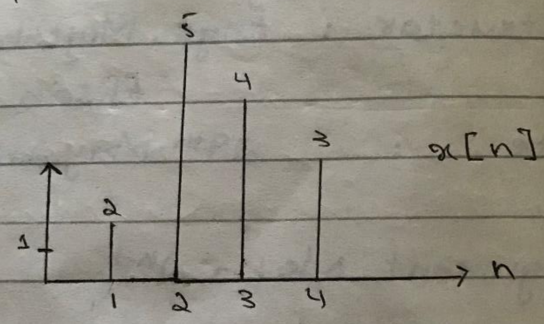
Date : 29th May, 2020

Assignment No: 2nd

Q:1

Evaluate the even & odd components for the given function.

Given:



Required:

Even & odd components of the above signal.

Solution:

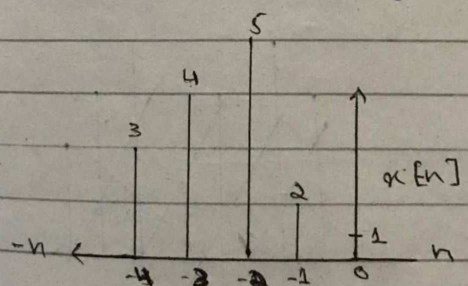
For Even :

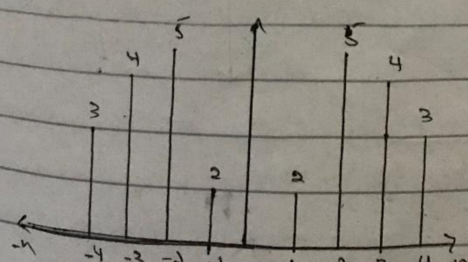
As we know that even components can be written as ;

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

So,

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

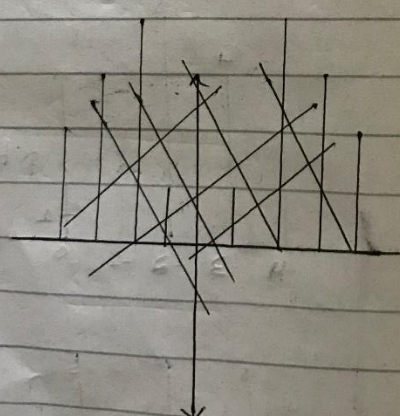


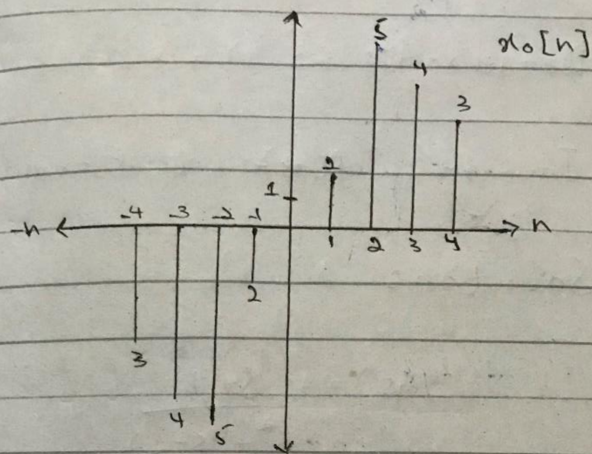


For odd:

As ~~odd~~ components can be written as or. we can find odd component by this

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





Q: 2

Calculate the inverse laplace trans-form of the given equation

Given:

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

Required:

Inverse Laplace transform

Solution:

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

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

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

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

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

$s+4 = A(s-2) + B(s+2) \rightarrow (i)$

for B:

let,

$s = 2$ in eq (i)

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

$6 = A(0) + B(4)$

$6 = B(4)$

÷ing 4 b/s

$\frac{\cancel{6}^{3}}{\cancel{4}_{2}} = \frac{B(\cancel{4})}{\cancel{4}}$

$B = \frac{3}{2}$

for A:

n

let,

> (A)

$S = -2$

put in eq (i).

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

$2 = A(-4) + B(0)$

$2 = A(-4)$

÷ing -4 b/s

$\frac{\cancel{2}^{1}}{\cancel{-4}_{2}} = \frac{A(-4)}{-4}$

$A = \frac{1}{-2}$

Now put values of A & B in eq (A)

~~we~~ get,

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

$= \frac{1}{-2}$

$= \frac{1}{-2}$

Q: 3

Discu
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$$= \frac{1}{-2} L^{-1} \frac{1}{s+6} + \frac{3}{2} L^{1}\left(\frac{1}{s-2}\right)$$

$$= \frac{1}{-2} e^{-6t} + \frac{3}{2} e^{2t}$$

Q:3 (i)

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

Answer:

To convert an ~~contin~~ analog signal to discrete signal it has to be passed from ~~f~~ Three different stages which are;

(i) Sampler
(ii) Quantiser
(iii) Coder.

All of the above stages are completed in two steps.

Step No 1:

Sampling converts a continous time continous amplitude signal to discrete time contionous amplitude (still real valued) signal. Only the time axis is discritised not the amplitude axis.

Step No:2:

Quantization converts the discrete time continouse amplitude

signal to
values ,
be repr
bits a
stored

$xa(t) \rightarrow$ Sam

Analog signal

The de
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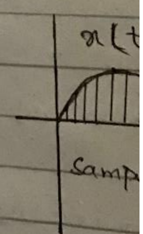
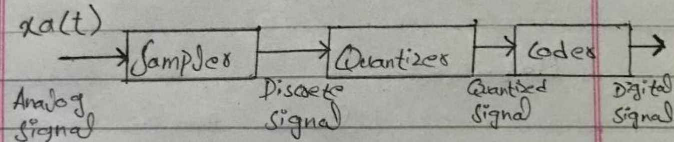
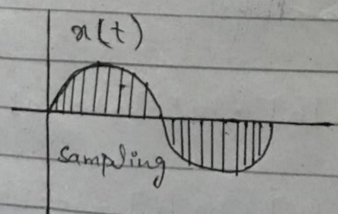
ADC (Ana

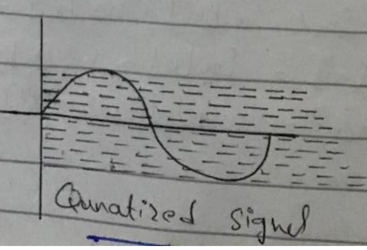


signal to set of finite values, so that it can be represented by finite bits and can be stored on computer.



The deviced used for converting the signals is called ADC (Analog to Digital converter).





Q : 4

~~Sol~~

Given:

$$x[n] \times [h_1[n] \times h_2[n]] =$$
$$[x[n] \times h_1[n]] \times h_2[n]$$

Required:

Show that they are equal.

Solution:

Let's Consider

$$y[n] = x[n] \times h_1[n] \times h_2[n]$$

let $x[n] + h_1[n] = w_1[n]$

$$y[n] = [x[n] \times h_1[n]] \times h_2[n] \rightarrow (i)$$

$$y[n] = w_1[n] \times h_2[n]$$

$$x[n] \longrightarrow \boxed{h_1[n]} \xrightarrow{w_1[n]} \boxed{h_2[n]} \longrightarrow y[n]$$

Now consider that.

$$w_2[n] = h_1[n] \times h_2[n]$$

$$y[n] = x[n] \times [h_1[n] \times h_2[n]]$$
$$= n[n] \times W_2[n]$$

$$x[n] \longrightarrow \boxed{w_2[n]} \longrightarrow y[n]$$

Proved:

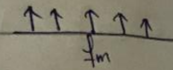
$$[x[n] \times h_1[n]] \times h_2[n] = x[n] \times [h_1[n] \times h_2[n]].$$

Q3 : (ii)

Solution:

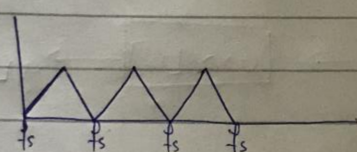
Nyquist criteria: $f = 60$ Hz

$f_s \geq 2 f_m$



$f_s \geq 2 \times 60$

$f_s = 120$



if $f_s = 120$ Hz there will be no aliasing occur as Nyquist Criteria proves it.