Department of Electrical Engineering
Sessional Assignment
Date: 05/05/2020

Course Details

Course Title: Signals & Systems **Module:** 04
Instructor: Sir Mujtaba Ihsan **Total Marks:** 20

Student Details

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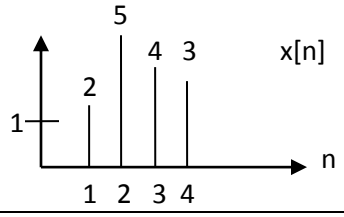
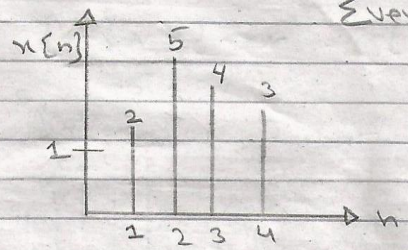
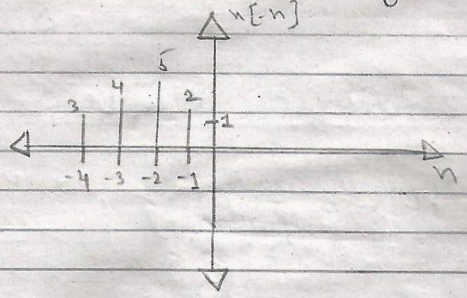
Q1.		**Evaluate** the even and odd components for the given function. 	Marks 05 CLO 1

Q1:- Even & odd

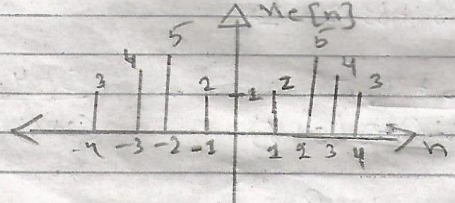


We have $x_e[n] = \frac{x[n] + x[-n]}{2}$

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



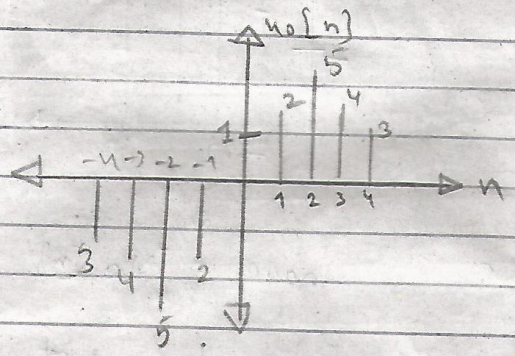
The even component can be drawn By using $x_e[n] = \frac{x[n] + x[-n]}{2}$



Q2.		**Calculate** the inverse Laplace transform of the given equation. $$\mathbf{Y(s) = \frac{s+4}{s^2 + 4s - 12}}$$	Marks 07
			CLO 3

Now

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



Q2:-

Inverse Laplace

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

Sol:-

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

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

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

$$s+4 = A(s-2) + B(s+2) \quad \text{---} \quad (1)$$

Now

Let $s = 2$ in eq (i)

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

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

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

Now let $s = -2$

$$-2+4 = A(-2-2) + B(-2+2)$$
$$2 = A(-4) + B(0)$$
$$\frac{2}{-4} = \frac{A(-4)}{-4}$$

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

Now Put them back

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

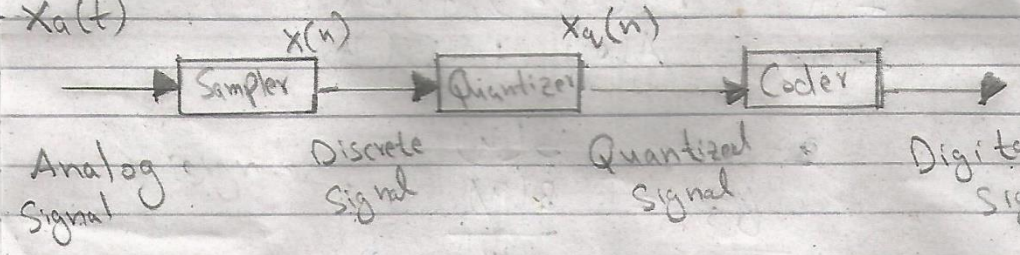
$$= \frac{1}{-2} L^{-1}\frac{1}{s+6} + \frac{3}{2} L^{-1}\left(\frac{1}{s-2}\right)$$

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

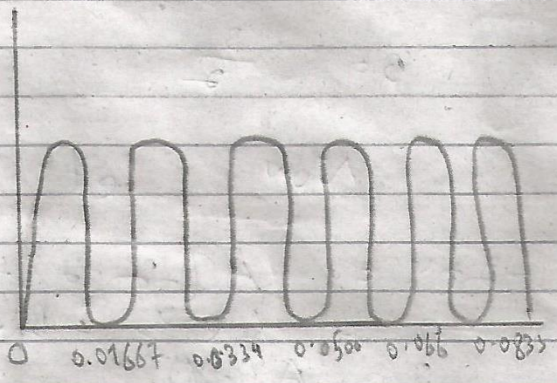
Q3.	i. ii.	**Discuss** the procedure of converting an analog signal into a digital one. Suppose an analog signal has a highest frequency of 60Hz. **Outline** the steps that will ensure that no aliasing occurs.	Marks 02+02 CLO 2

Q3:- Conversion of Analog Signal into Digital :-

a)



b)



No Aliasing

Q4.		**Show** that: $x[n] * [h_1[n] * h_2[n]] = [x[n] * h_1[n]] * h_2[n]$	Marks 04 CLO 2

Q4:- Show that

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

Consider

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

Let $x[n] * h_1[n] = w_1[n]$

$$y[n] = [x[n] \times h_1[n]] \times h_2[n] \quad \text{---(i)}$$

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

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

Now Consider that

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

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

$$= x[n] \times w_2[n]$$

$x[n] \longrightarrow [w_2[n]] \longrightarrow y[n]$

Hence Proved

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