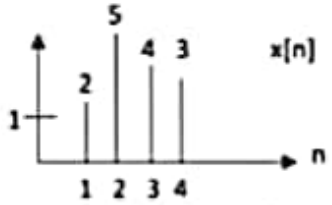
Department of Electrical Engineering
Sessional Assignment
Date: 05/05/2020

Course Details

Course Title: Signals & Systems **Module:** 04
Instructor: _____ **Total Marks:** 20

Student Details

Name: _____ **Student ID:** _____

Q1.		**Evaluate** the even and odd components for the given function.  	Marks 05 CLO 1
Q2.		**Calculate** the inverse Laplace transform of the given equation. $$Y(s) = \frac{s+4}{s^2+4s-12}$$	Marks 07 CLO 3
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
Q4.		**Show** that: $x[n] * [h_1[n] * h_2[n]] = [x[n] * h_1[n]] * h_2[n]$	Marks 04 CLO 2

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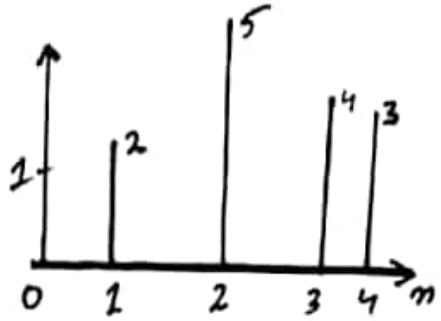
Assignment = Signal and System
Teacher = Mujtabah Ihsan Sb
Dated = 04/06/2020

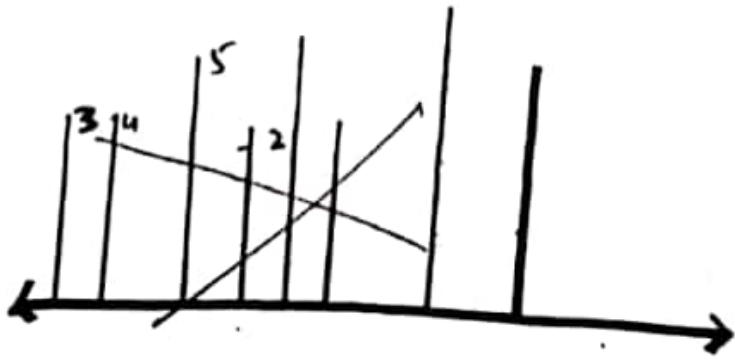
Q1: Evalute the Even and odd components For Given Function:

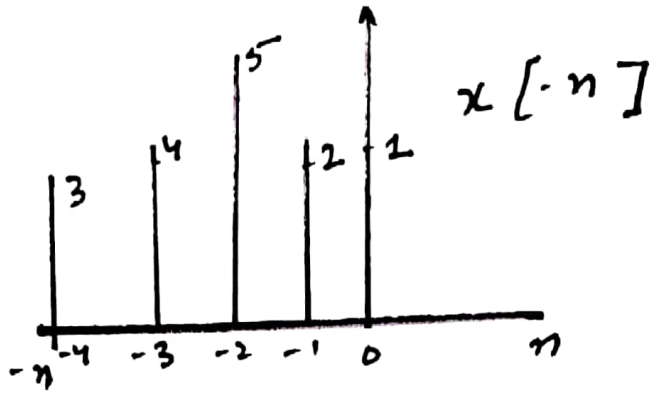


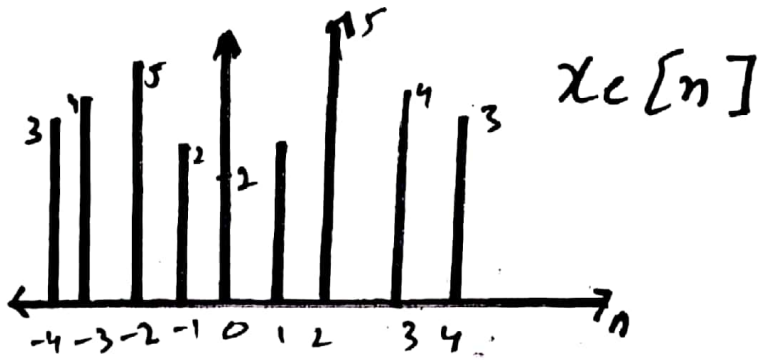
Sol: As we know That the even componants of a function can be written as

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

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

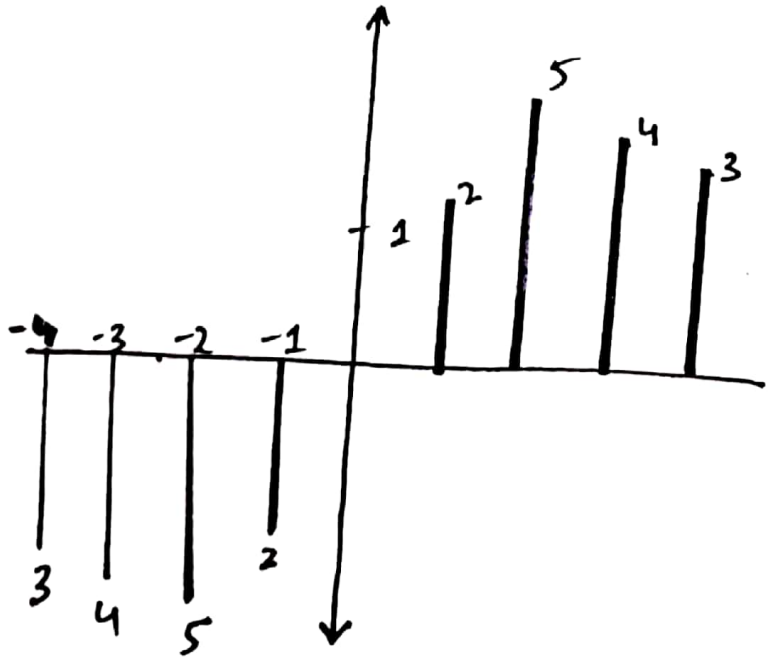






odd components of a function can be written as:

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



Q2: $y(s) = \dfrac{s+4}{s^2+4s-12}$

Sol:

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

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

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

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

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

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

or Taking Lcm Both Side

$$\Rightarrow y(s) = (s+4) = A(s+6) + B(s-2) \quad -(1)$$

Let $s = -6$ in eq (1)

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

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

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

Let $s = 2$ in eq (1)

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

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

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

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

$$6 = A(8)$$

$$A = 6/8 \Rightarrow \frac{2}{4} \Rightarrow \frac{1}{2}$$

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

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

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

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

$$\boxed{y(s) = \frac{1}{2} e^{2t} + 4 e^{-6t}}$$

, inver laplace Transform

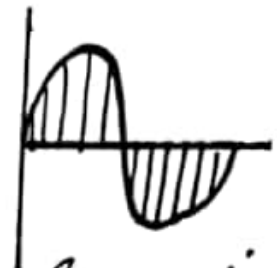
Q3:-(1)

Ans:

1) Sampaling
2) Quantization

(1) Sampaling converts a continuse time continue amplitude (reel valued) signal to discret time continuse amplitude (still real valued) signal Kemmembes only time axis is discritized and not the amplitued axis

(2) Quantization converts the discret time continuse amplitude signal to set of finit values so that it can be represenced by finite bits and can be stored on computer.



Sampaling

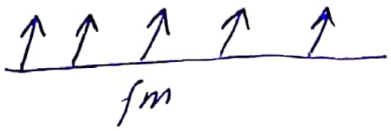
Quantization

Q3:
(ii)

Sol:-

$F = 60\ Hz$

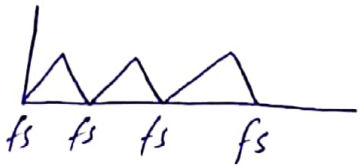
from riquist criteria



$$f_s \geq 2 f_m$$

$$f_s \geq 2 \times 60$$

$$f_s = 120$$



if $f_s = 120Hz$ there will be no aliasing occurs at riquist criteria proves it.

24:-

Sol:=>

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

Consider

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

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

Now

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

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

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

Now

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

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

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

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

As both block diagram give the same Response we can write

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