Department of Electrical Engineering

Sessional Assignment

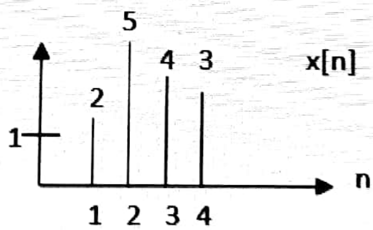
Date: 05/05/2020

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

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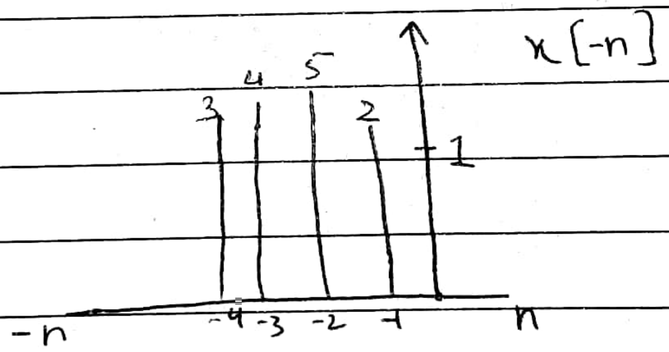
Subject :- Signals & Systems

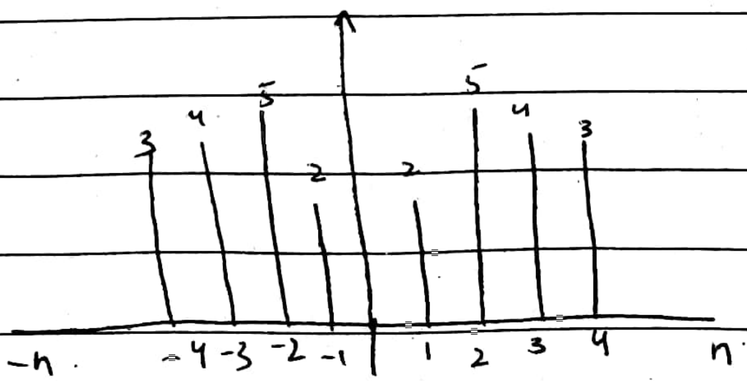
(Question 1)

Sol:- We know that the even function can be written

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

Reflecting $x[n] = x[-n]$





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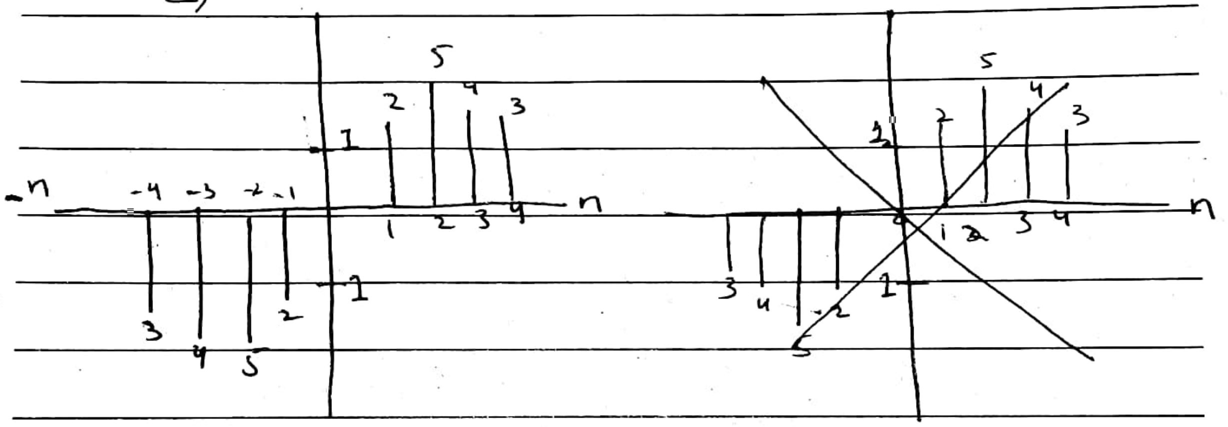
odd component can be written

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

$x_o[n]$



(Question 2)

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

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

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

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

~~$s+4$~~

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

Multiplying it by both sides

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

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

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

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

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

Let $S = 2$ in eq (i)

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

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

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

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

$$6 = A(8)$$

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

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

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

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

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

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

Question 3 (i)

Ans) Following is the procedure of converting analog signal into digital one.

i) Sampling :-

Sampling converts a continous time amplitude signal to discret time continous amplitude signal.

ii) Quantization :-

it converts the discret time continous amplitude signal to set of finite values so that it can be represented by finite bits and can be stored on computer.

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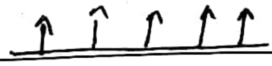
Part (ii)

Sol:-

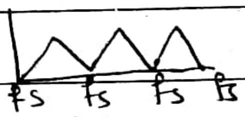
$F = 60\ Hz$



$f_s \geq 2 f_m$

$f_s \geq 2 \times 60$

$f_s = 120$



If $f_s = 120\ Hz$ there will be no aliasing occuring.

(Question 4)

Sol:- $x[n] \times [h_1[n] \times h_2[n]] = [x[n] \times h_1[n]] \times h_2[n]$

Consider

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

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

Now

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

$y[n] = W_1[n] \times h_2[n]$

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$x[n] \longrightarrow h_1[n] \longrightarrow h_2[n] \longrightarrow y[n]$

Now

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

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

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

$x[n] \longrightarrow W_2[n] \longrightarrow y[n]$

Both block diagram give the same response

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