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Subject: Signal And System

Assignment

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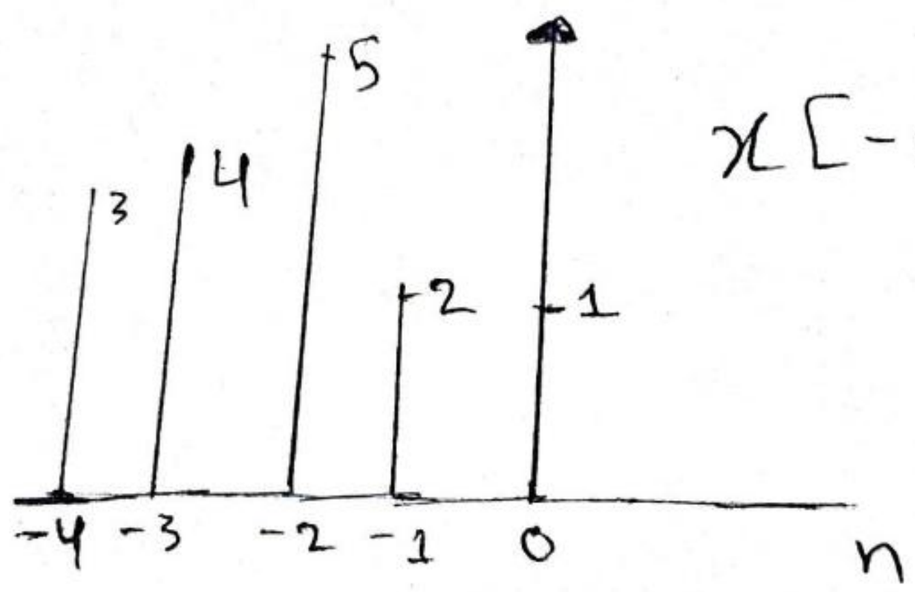
Q 1

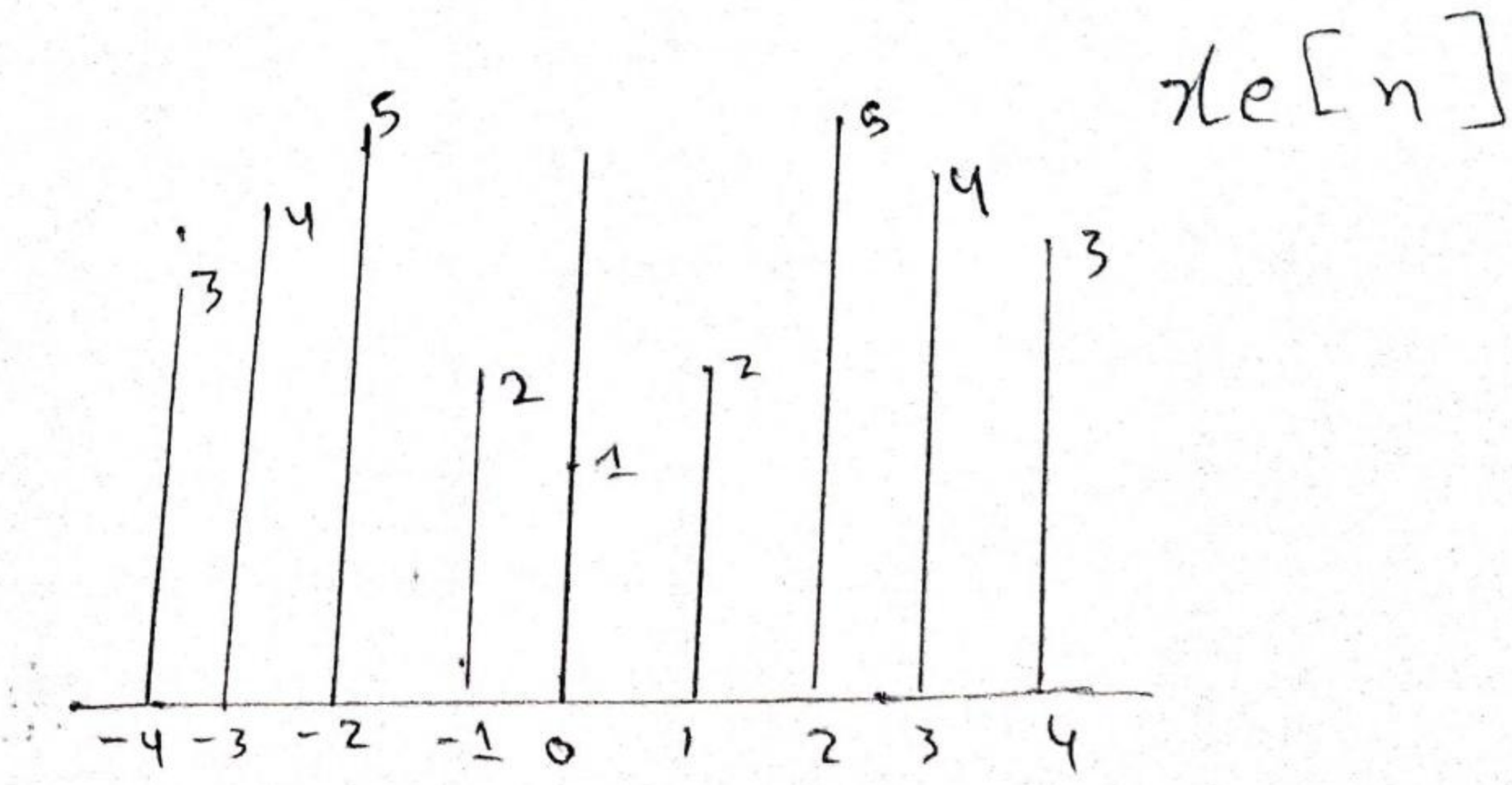
Ans:

Formula for even component of a function.

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

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

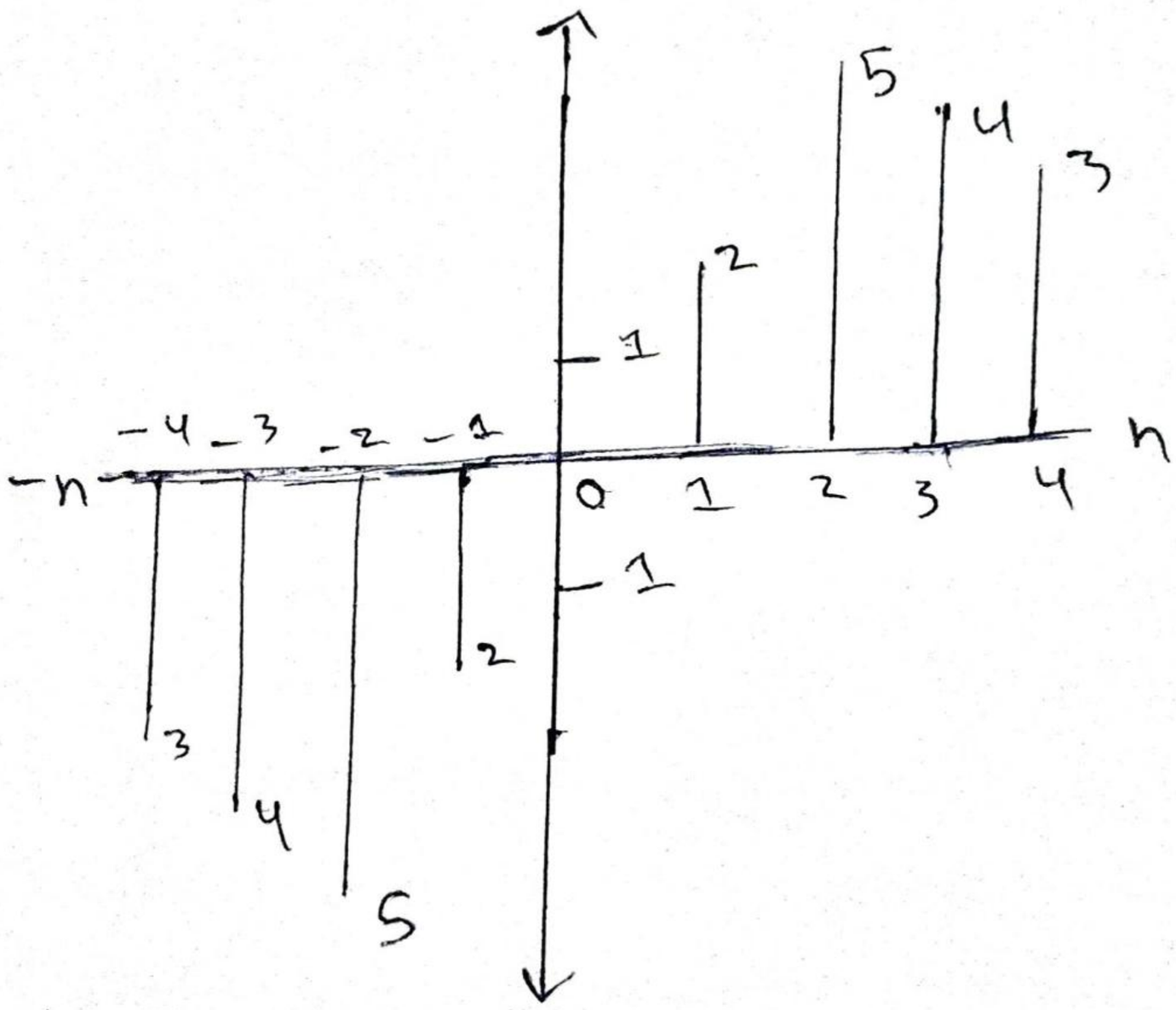




Odd component of a function

formula is

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



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

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

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

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

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

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

Multiplying both sides by $(s-2)$

$(s+5)$

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

Let $s = -6$ in eq ①

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

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

$$-2 = B(-8)$$

$$B = \frac{+2}{+8} = \frac{1}{4}$$

let $s = 2$ in eq (1)

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

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

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

$$6 = A(8)$$

$$A = \frac{6}{8}^{3}_{4}$$

$$A = \frac{3}{4}$$

$$ys = \frac{\frac{3}{4}}{(s-2)} + \frac{\frac{1}{4}}{(s+6)}$$

$$= \frac{3}{4} L^{-1}\left(\frac{1}{s-2}\right) + \frac{1}{4} L^{-1}\left(\frac{1}{s+6}\right)$$

$$= \frac{3}{4} e^{2t} + \frac{1}{4} e^{-6t}$$

Q3 (1)

Ans: Analog Signal is converted into digital signal through Sampling and Quantization

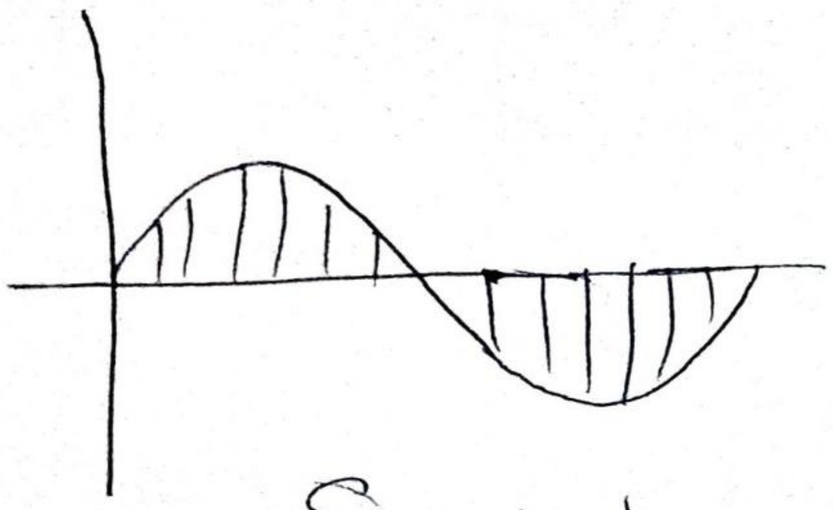
Sampling

Sampling converts a continous time continous amplitude signal to discrete time continous amplitude signal. only time axis is discrete, not the amplitude axis

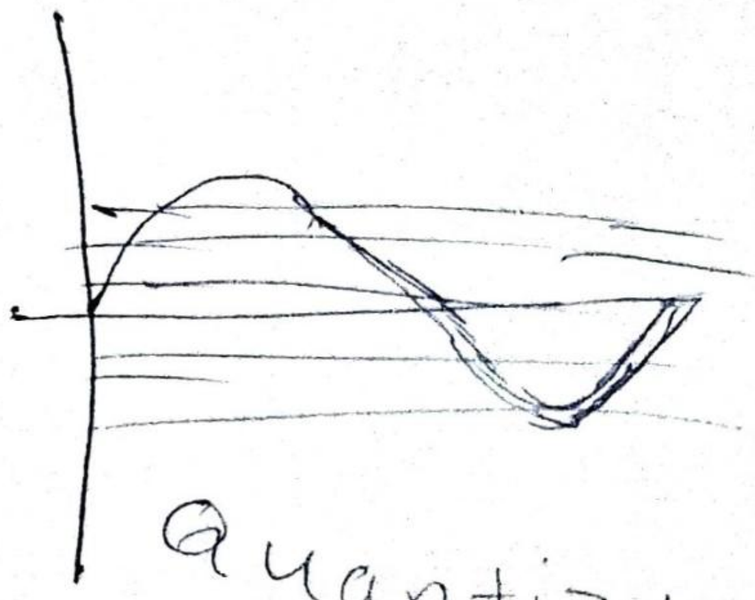
Quantization

It converts the discrete time Continous amplitude signal into discrete time and discret value so that it can be represented by finit bits and stored on Computer.

The device used for this purpose is Analog to Digital converter ADC.



Sampling



quantization

Q4 Show that

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

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

Sol:

Consider

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

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

Now

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

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

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

Now consider that

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

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

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

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

As both block diagram give the same response so

$X[n] * [h_1[n] * h_2[n]] = [x[n] * h_1(n) * h_2[n]]$