P.No 1

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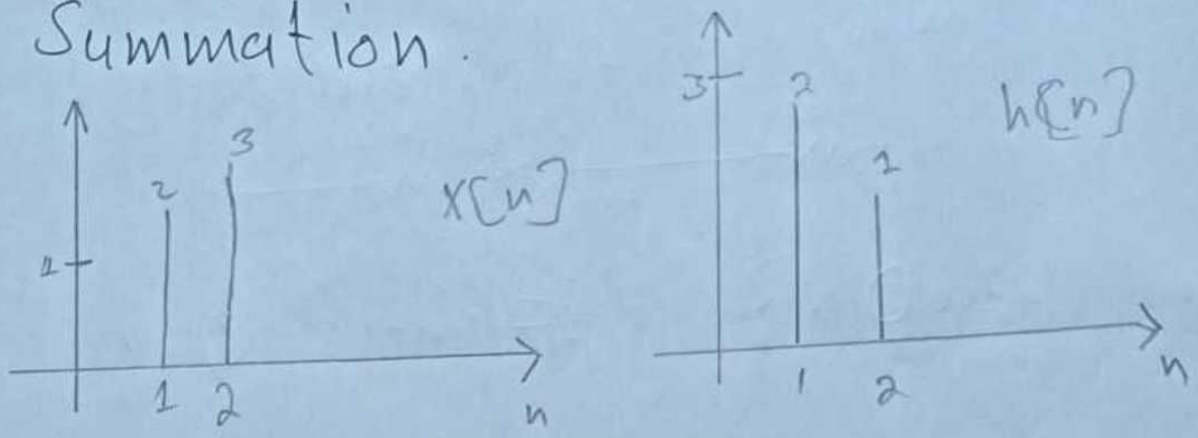
Instructor: Mujtaba Ihsan Sir.

Subject: Signal & System

Marks: 30

Q No 1

a):- Evaluate x[n] using convolution Summation.



Answer:-

Convolution Sum:-

The convolution sum is a fast way to find the coefficients of the polynomial resulting from the multiplication of two polynomials.

The summation is called the convolution sum of the sequance x[n] and h[n] and represented compactly

$R_{Th} = 4k\Omega$ and the time constant is

$$\tau = R_{Th} C = 4 \times 10^3 \times 0.5 \times 10^{-3} = 2s$$

Since the capacitor act like an open circuit to dc at steady state.

$v(\infty) = 30\ V$ Thus

$$v(t) = v(\infty) + [v(0) - v(\infty)] e^{-t/\tau}$$

$$= 30 + (15 - 30) e^{-t/2} = (30 - 15e^{-0.5t})\ V$$

At $t = 2$

$$v(2) = 30 - 15e^{-0.5(2)}$$

$$v(2) = 30 - 15e^{-1}$$

$$v(2) = 30 - 15(0.3678)$$

$$v(2) = 30 - 5.517$$

$$v(2) = 24.483\ V$$

At $t = 8$

$$v(8) = 30 - 15e^{-0.5(8)}$$

$$v(8) = 30 - 15e^{-4}$$

$$v(8) = 30 - 15(0.0183)$$

$$v(8) = 30 - 0.2745$$

$$v(8) = 29.7255\ V$$

Q No 1

b):- Sketch block diagram for the given system.

$$y[n] = x[n] + x[n-2]$$

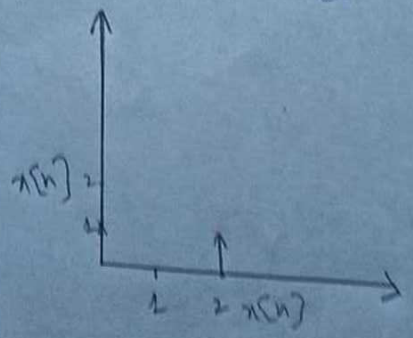
Answer:-

The given System is below.

$$y[n] = x[n] + x[n-2].$$

and

The block diagram for the given system is

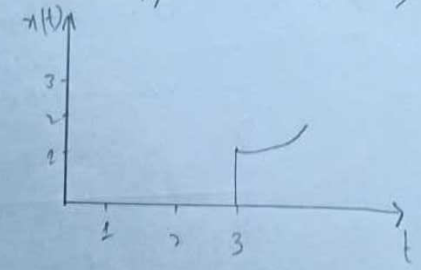


Q No 2

a):- Sketch the transformed versions for the signal $x(t)$ mentioned in (i). and (ii).

i) $x(t+5)$ and $x(3t)$

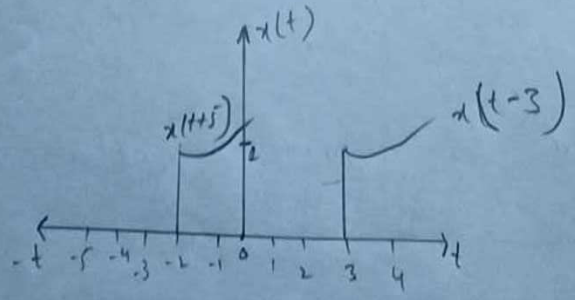
ii) $x(t/4)$ and $x(t-2)$



Answer:-

Solution for (i):- $x(t+5)$ & $x(3t)$

Now $y(t) = x(t-3)$, $z(t) = x(t+5)$



Translation:- This diagram shows translation which is

from right to left.

At $t=3$, $x(t)=1$

At $t+5=3$, $x(t)=1$

$t=-5+3$

$\boxed{t=-2}$

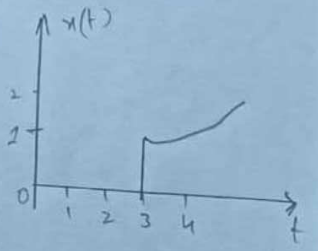
Compare:- $x(3t)$

At $t=3$, $x(t)=1$

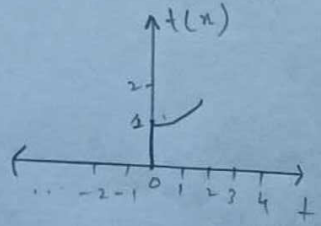
At $3t=3$, $x(3t)=1$

$t=3/3$

$\boxed{t=1}$



So $y(t)=x(t-3)$, $z(t)=x(3t)$



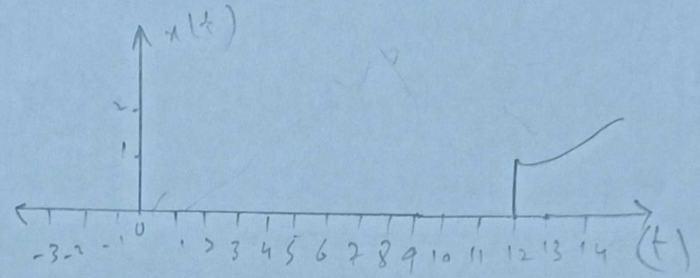
Now solution for (ii):- $x(t/4)$ & $x(t-2)$

At $t=3$, $x(t)=1$

At $t/4 = 3$, $x(t/4) = 1$

$t/4 = 3$

$\boxed{t = 12}$



Time delay :-

$x(t-2)$

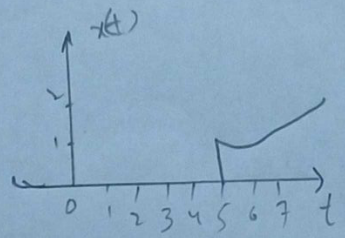
At $t = 3$, $x(t) = 1$

At $t-2 = 3$, $x(t) = 1$

$t = 2+3$

$\boxed{t = 5}$

So



Q No 2

b):- outline the given systems as invertible or non-invertible, linear or non-linear, causal or non causal. Given the reason for you answers too.

i) $y[n] = x^2[n]$

ii) ~~$x(t+1)$~~ $y[n] = x[n+2]$

Answer:-

(i) $x[n] = x^2[n]$

The system is non-invertible because we can not determine the sign of the input from knowledge of output.

ii) $y[n] = x[n+2]$

the system is non-causal, because its output involves future value of the input so it is non-causal.

Q3:.

Fill in the blanks.

" if a time shift in the input signal results in an identical time shift in the output signal, the system is said to be Even .