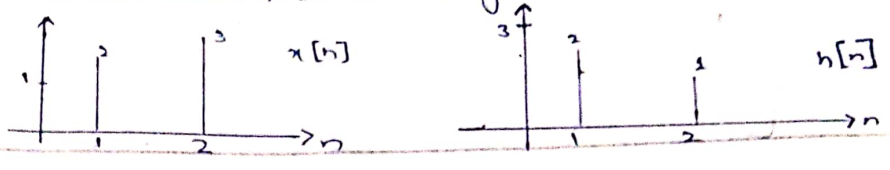
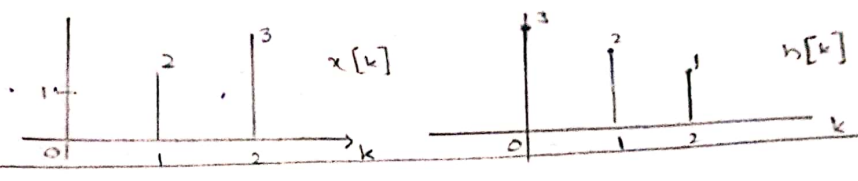


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Subject Signal and System
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Date 25/04/2020

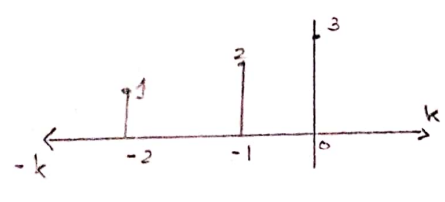
Q.1 (a) Evaluate $Y[n]$ using convolution sum.



Solutions:- Replace n with k



Now invert $h[k]$ to get $h[-k]$

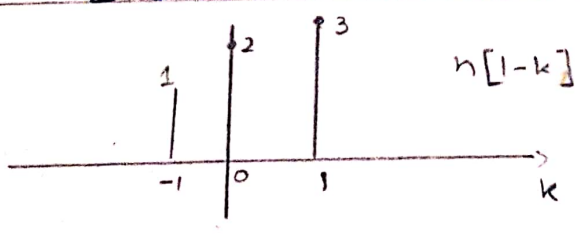


$$Y[0] = (1 \times 3) \delta[n]$$

$$Y[0] = 3 \delta[n]$$

Now convolving $x[k]$ with $h[1-k]$

$$Y[1] = x[k] h[1-k]$$



$$Y[1] = [(1 \times 2) + (2 \times 3)] \delta[n-1]$$

$$Y[1] = [2 + 6] \delta[n-1]$$

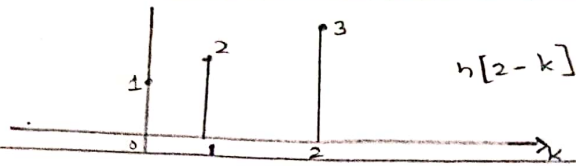
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$$Y[1] = 8 \delta[n-1]$$

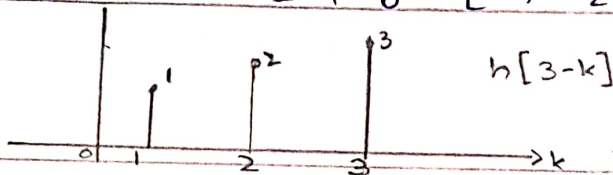


$$Y[2] = x[k] h[2-k]$$

$$Y[2] = [(1 \times 1) + (2 \times 2) + (3 \times 3)] \delta[n-2]$$

$$Y[2] = [1 + 4 + 9] \delta[n-2]$$

$$Y[2] = 14 \delta[n-2]$$

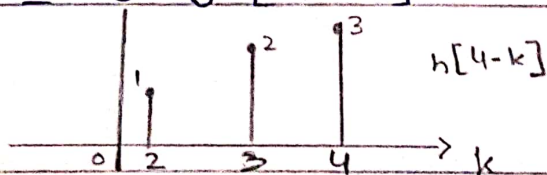


$$Y[3] = x[k] h[3-k]$$

$$Y[3] = [(1 \times 2) + (2 \times 3)] \delta[n-3]$$

$$Y[3] = [2 + 6] \delta[n-3]$$

$$Y[3] = 8 \delta[n-3]$$



$$Y[4] = x[k] h[4-k]$$

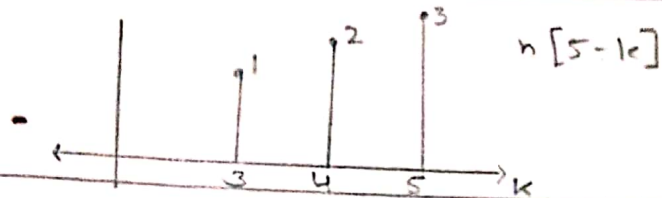
$$Y[4] = [(1 \times 3)] \delta[n-4]$$

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$$Y[4] = 3 \delta[n-4]$$



$$Y[5] = x[k] h[5-k]$$

$$Y[5] = [0] \delta[n-5]$$

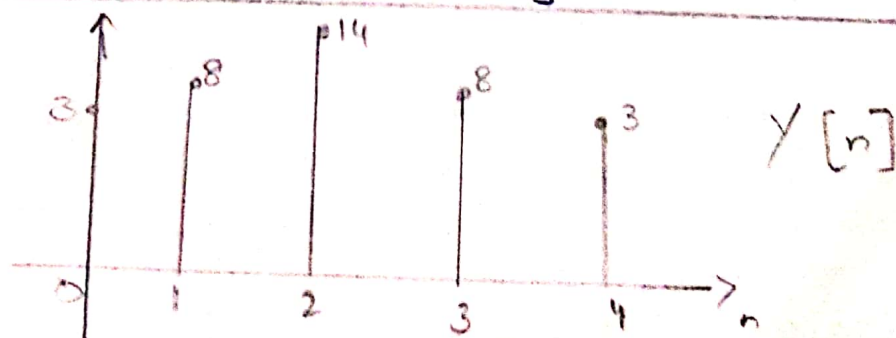
$$Y[5] = 0$$

As there is no relativity between $x[n]$ and $h[-k]$ for $n > 4$, so $y[n] = 0$ for $n > 4$.

$$\text{So, } Y[n] = y[1] + y[2] + y[3] + y[4]$$

$$Y[n] = 3 \delta[n] + 8 \delta[n-1] + 14 \delta[n-2] + 8 \delta[n-3]$$

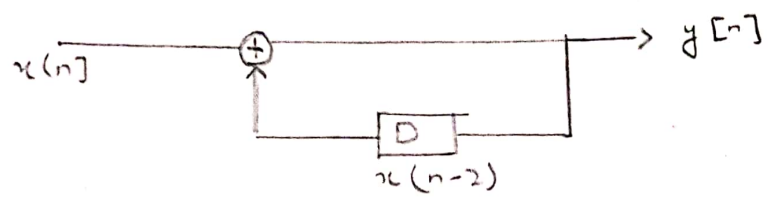
$$+ 3 \delta[n-4]$$



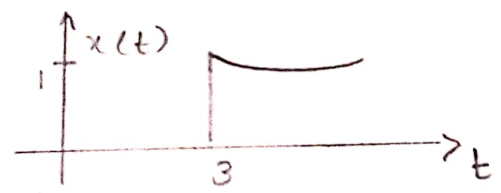
Q:1 (b) Sketch the block diagram for the given system.

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

Aus:-



Q:2 (a) Sketch the transform version for the signal $x(t)$ mentioned in i & ii.



- ~~(i)~~ (i) $x(t+5)$ & $x(3t)$
- (ii) $x(t/4)$ & $x(t-2)$

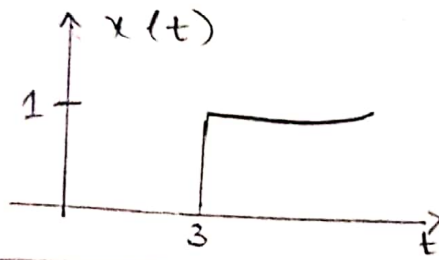
(ii) Ans 2(a)

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(i)

$x(t+5)$

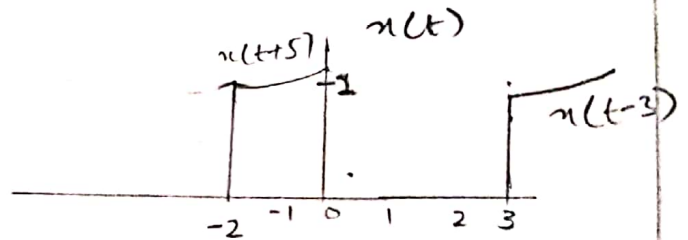
$$t = 3$$

$$x(t) = 1$$

$$t+5 = 3$$

$$t = 3-5$$

$$t = -2$$



$x(3t)$

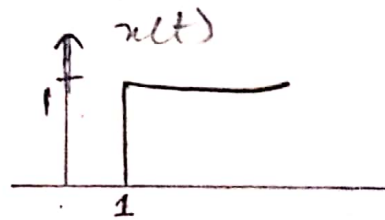
$$t = 3$$

$$x(t) = 1$$

$$3t = 3$$

$$t = 3/3$$

$$t = 1$$



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(ii)

$$x(t/4)$$

$$t = 3$$

$$x(t) = 1$$

$$t/4 = 3$$

$$t = 3 \times 4$$

$$t = 12$$



$$x(t-2)$$

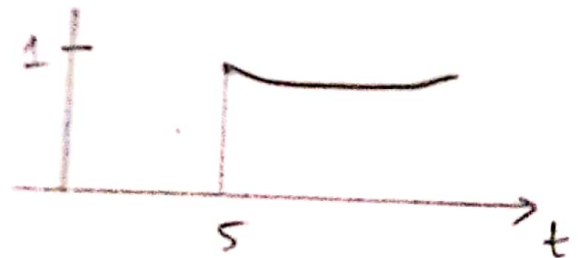
$$x(t) = 1$$

$$t = 3$$

$$t-2 = 3$$

$$t = 3 + 2$$

$$t = 5$$



Q. 2 (b)

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Outline given system as invertible

or non-invertible, linear or non-linear, causal or non-causal. Give reasons.

(i) $Y[n] = x^2[n]$ (ii) $Y[n] = x[n+2]$

Ans:-
2 (b) (i) $Y[n] = x^2[n]$

This system is non-invertible, because we cannot determine the sign of input from knowledge of output.

(ii) $Y[n] = x[n+2]$

This system is non-causal because its output involves future values of the input so its non-causal.

Q. ③ Fill in the blank.

If the time shift in the input signal results in an identical time shift in the output signal.

Ans: The system is said to be
Time Invariant.