Department of Electrical Engineering

Course Details

Course title :- Signal & System
Module :- 04
Instructor :- Engr Mujtaba Ihsan
Total Marks :- 30

Student Details

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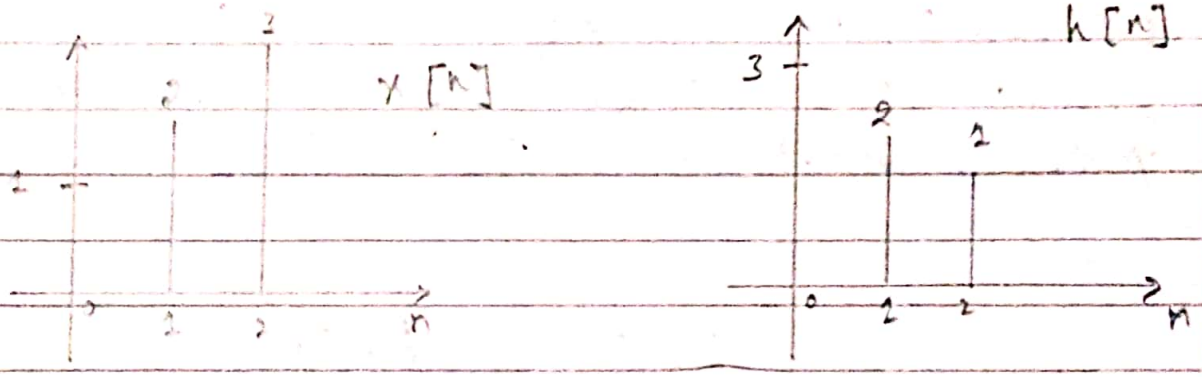
ID # 14569

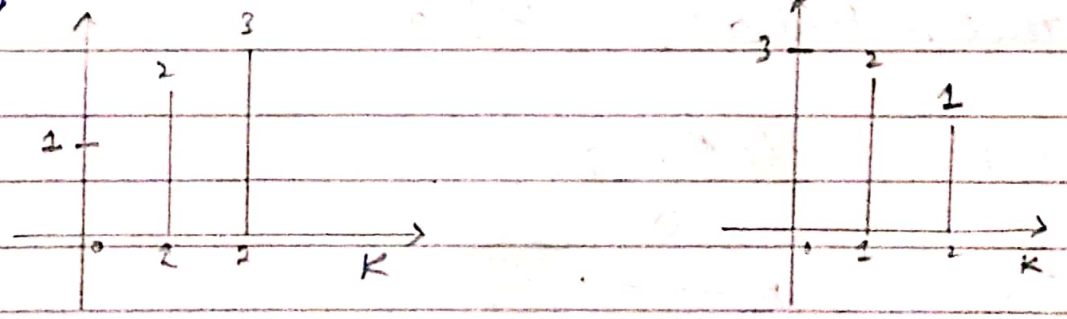
Sign :- 

Q:-1

(a) Evaluate $y[n]$ using convolution summation.



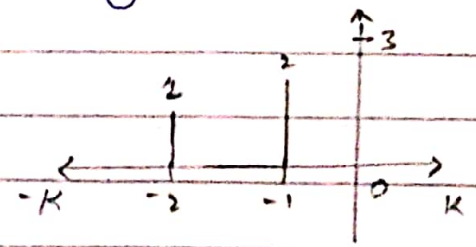
Sol:- Replace n with k



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

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

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



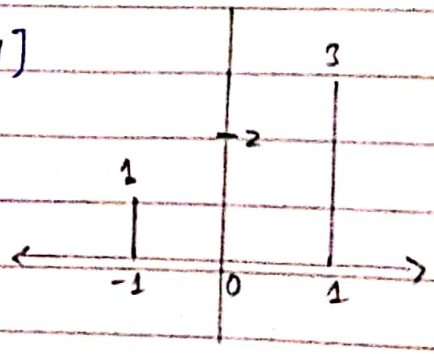
Now convolving $x[k]$ with $h[1-k]$,

$$y[1] = x[k]\ h[1-k]$$

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

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

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



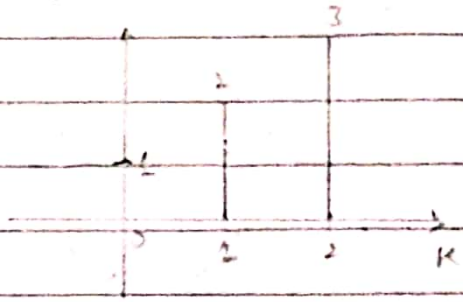
P.NO 3

$$y[2] = x[k]\, h[2-k]$$

$$y[2] = [(1\times1) + (2\times2) + (3\times3)]\, \delta[n-2]$$

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

$$y[2] = 14\, \delta[n-2]$$

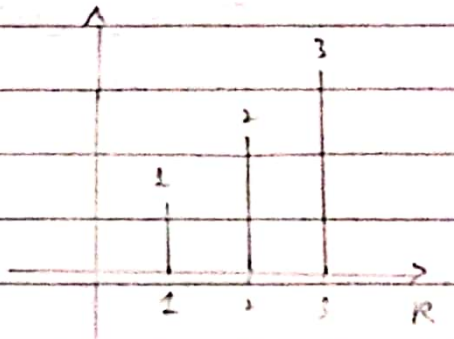


$$y[3] = x[k]\, h[3-k]$$

$$y[3] = [(1\times2) + (2\times3)]\, \delta[n-3]$$

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

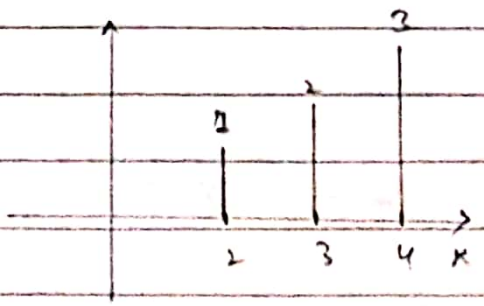
$$y[3] = 8\, \delta[n-3]$$



$$y[4] = x[k]\, h[4-k]$$

$$y[4] = [(1\times3)]\, \delta[n-4]$$

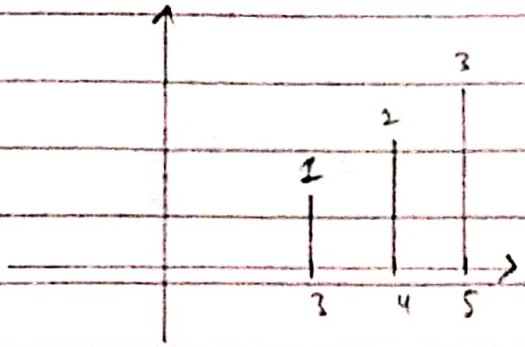
$$y[4] = 3\, \delta[n-4]$$



$$y[5] = x[k]\, h[5-k]$$

$$y[5] = [0]\, \delta[n-5]$$

$$y[5] = 0$$

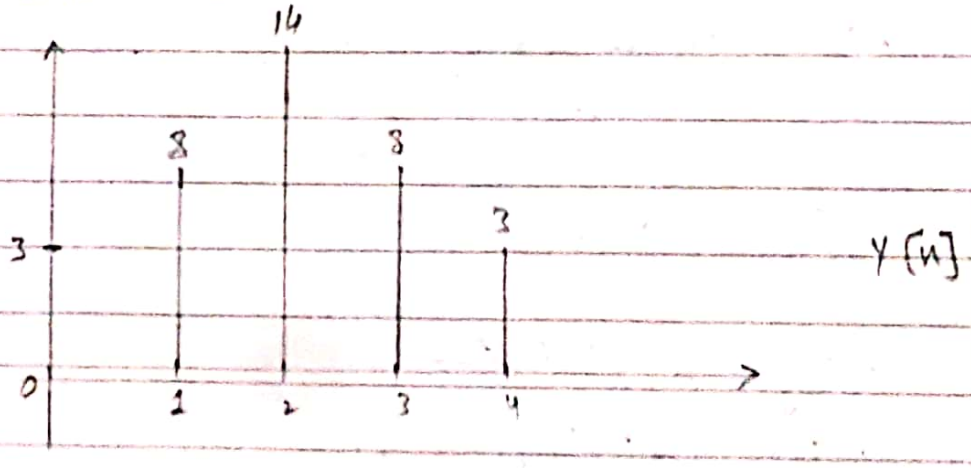


As there is no relativity between $x[k]$ and $u[-k]$ for $n > 4$, so $y[n] = 0$ for $n > 4$

So

$$y[n] = y[0] + y[1] + y[2] + y[3] + y[4]$$

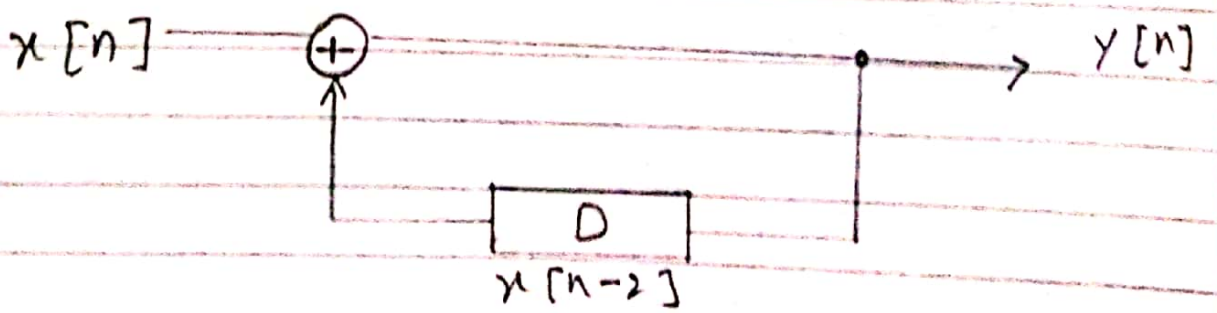
$$y[n] = 3\delta[n] + 8\delta[n-1] + 14\delta[n-2] + 8\delta[n-3] + 3\delta[n-4].$$



(b) Sketch block diagram for the given system.

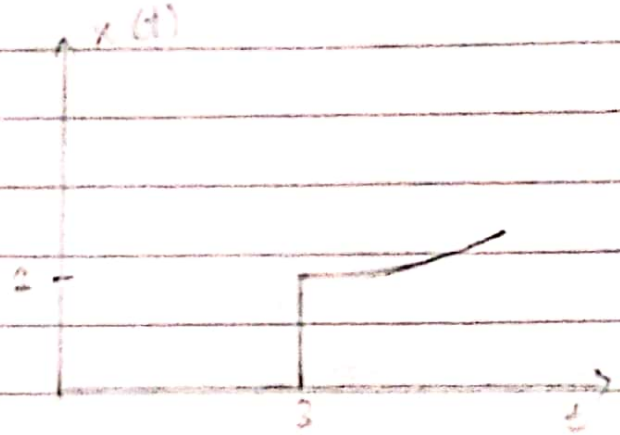
$$y[n] = x[n] + x[n-2].$$

Sol..



Q1.2

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



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

Sol:- As

$$x(t+5)$$

NOW

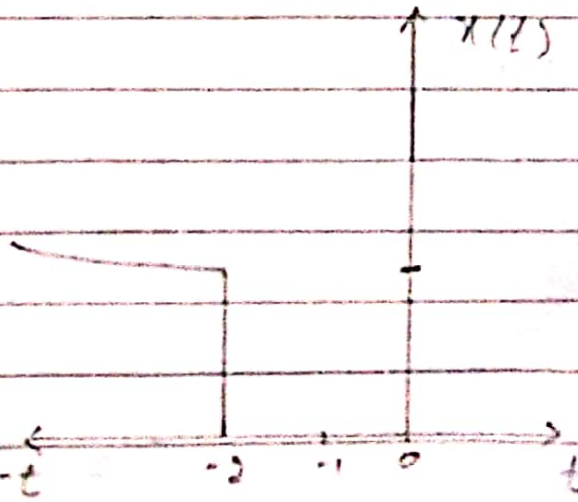
$$t = 3 \quad , \quad x(t) = 1$$

So

$$t + 5 = 3$$

$$t = 3 - 5$$

$$t = -2$$



As

$x(3t)$

Now,

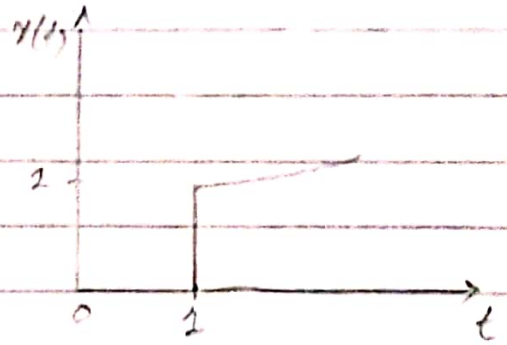
$t = 3 \qquad x(t) = 1$

So,

$3t = 3$

$t = \frac{3}{3}$

$t = 1$



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

Sol:- As

$x(t/4)$

Now

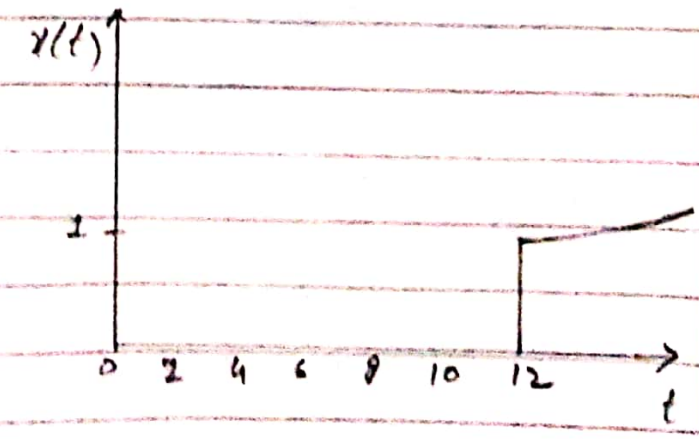
$t = 3 \qquad x(t) = 1$

So,

$t/4 = 3$

$t = 4 \times 3$

$t = 12$



As

$$x(t-2) \quad , \quad x(t) = 1$$

Now

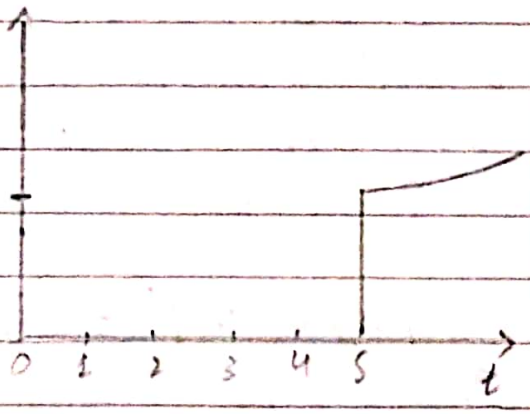
$$t = 3 \qquad x(t) = 1$$

So,

$$t - 2 = 3$$

$$t = 3 + 2$$

$$t = 5$$



(b) outline the given system as invertible or non-invertible, Linear or non-linear, causal or non-causal. Give the reason for your answers too.

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

Ans:- The given system is non-invertible, non-Linear, Because the given system does not satisfied the superposition principle and we cannot determine the sign of the input from the knowledge of the output.

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

Ans:- The given system is non-causal, linear and invertible. Because it satisfied superposition principle, In the given system distinct inputs leads to distinct outputs and the given system involves future value of the input.

Q:-3 If a time shift in the input signal result in an identical time shift in the output signal, the system is said to be

Ans:- Time Invariance.

The END.