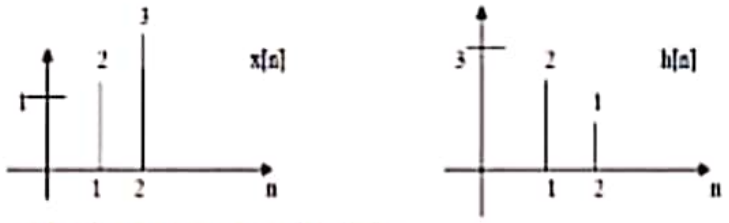
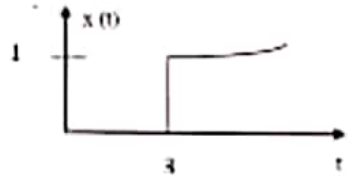
Department of Electrical Engineering
Assignment
Date: 20/04/2020

Course Details

Course Title: Signals & Systems **Module:** 04
Instructor: _____ **Total Marks:** 30

Student Details

Name: mohsin ali **Student ID:** 13746

Q1.	(a)	**Evaluate y[n] using convolution summation.**  	Marks 08 CLO 2
	(b)	**Sketch block diagram for the given system.** $y[n] = x[n] + x[n-2]$	Marks 06 CLO 2
Q2.	(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)	Marks 08 CLO 1
	(b)	**Outline the given system as invertible or non invertible, linear or non linear, causal or non causal. Give the reason for you answers too.** i. $y[n] = x^4[n]$ ii. $y[n] = x[n+2]$	Marks 06 CLO 1
Q3.		**Fill in the blank.** **If a time shift in the input signal results in an identical time shift in the output signal, the system is said to be _____**	Marks 02 CLO 1

Mohsin Ali

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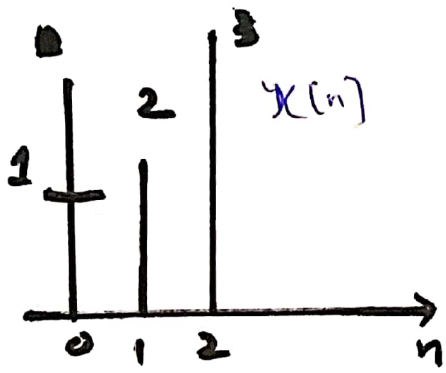
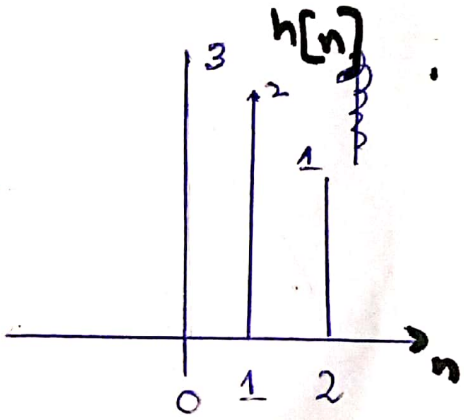
Submited to Sir Mujtaba Ihsan

Q1 (a)

Evaluate $x[n]$ using convolution summation.





Solution

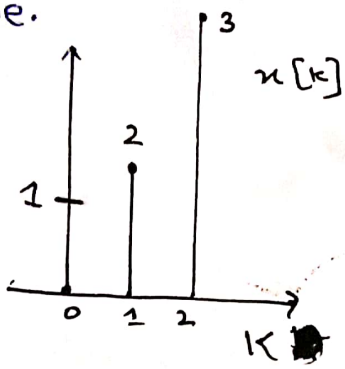
As we know that the formula for convolution summation is given by

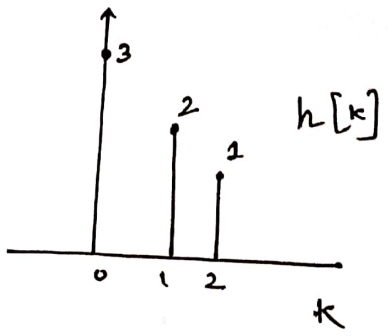
$$y[n] = x[n] * h[n]$$

$$y[n] = \sum_{k=-\infty}^{\infty} x[k] \cdot h[n-k]$$

Step #1:

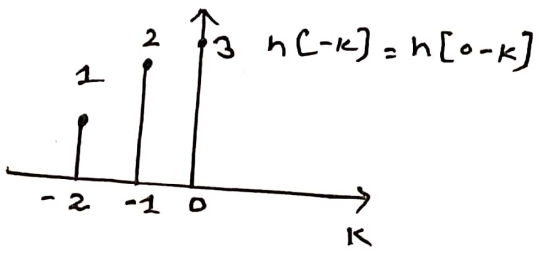
Replace "k" for "n" in the given signal and Impulse Response.





Step II:

Reflect the signal (i.e Impulse response) to get $h[-k]$



Step III:

For the interval.

$$-\infty < n < 0$$

$h[n-k]$ is value between $-\infty$ and $0-$ so when $h[n-k]$ is multiplied by $x[k]$ the out put is zero. i.e

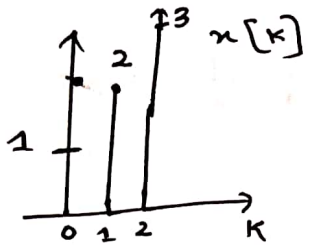
$$\boxed{y[n] = 0}$$

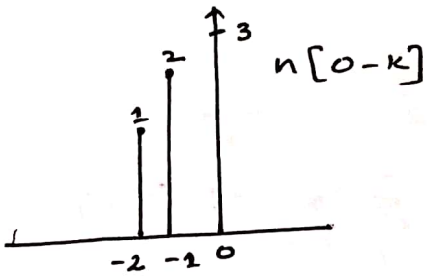
P.T.O

3)

For $n \geq 0$

At $n = 0$





i.e

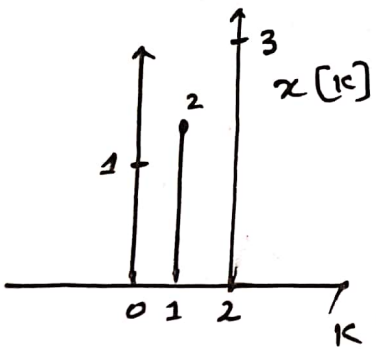
$$y[0] = \sum_{k=-\infty}^{\infty} x[k]\, h[0-k]$$

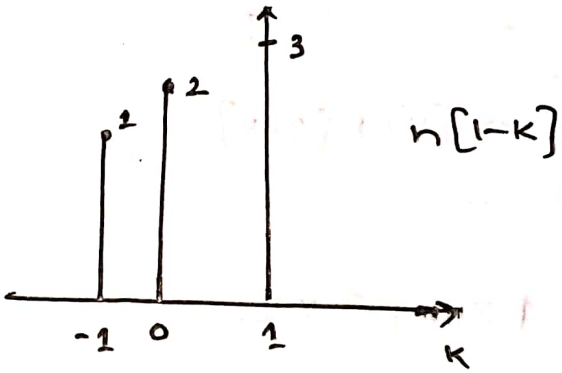
$y[0] = 1 \times 3$

$y[0] = 1 \times 3$

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

At $n = 1$





i.e

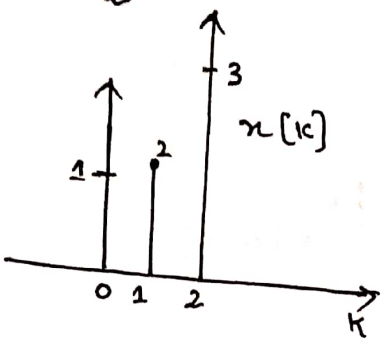
$$y[1] = \sum_{k=-\infty}^{\infty} x[k]\, h[1-k]$$

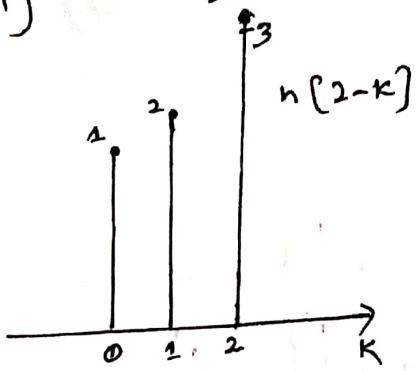
$y[1] = 1 \times 2 + 2 \times 3$

$y[1] = 2 + 6$

$y[1] = 8 \Rightarrow 8\delta[n-1] \longrightarrow ii)$

At $n=2$





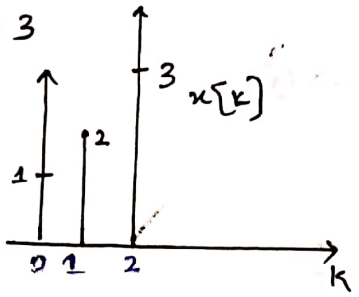
$$y[2] = \sum_{k=-2}^{\infty} x[k]\,h[2-k]$$

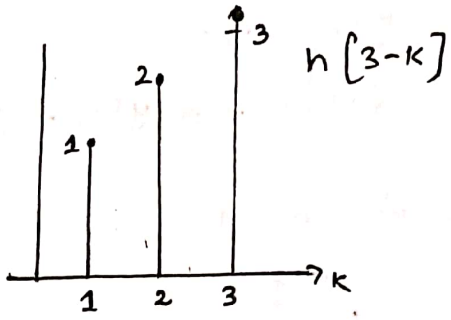
$$y[2] = 1\times1 + 2\times2 + 3\times3$$

$$= 1+4+9 = 14$$

$$y[2] = 14\,\delta[n-2] \longrightarrow \text{iii)}$$

At $n=3$



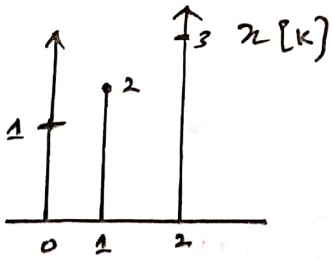


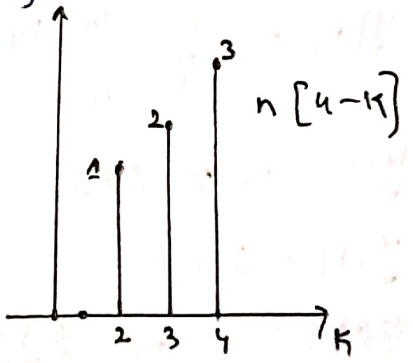
$$y[3] = \sum_{k=-2}^{\infty} x[k]\,h[3-k]$$

$$y[3] = 1\times2 + 3\times2$$

$$y[3] = 2+6 = 8 \Rightarrow 8\,\delta[n-3] \rightarrow \text{iv}$$

At $n=4$





$$y[4] = 3\times1 = 3\,\delta[n-4] \rightarrow \text{v}$$

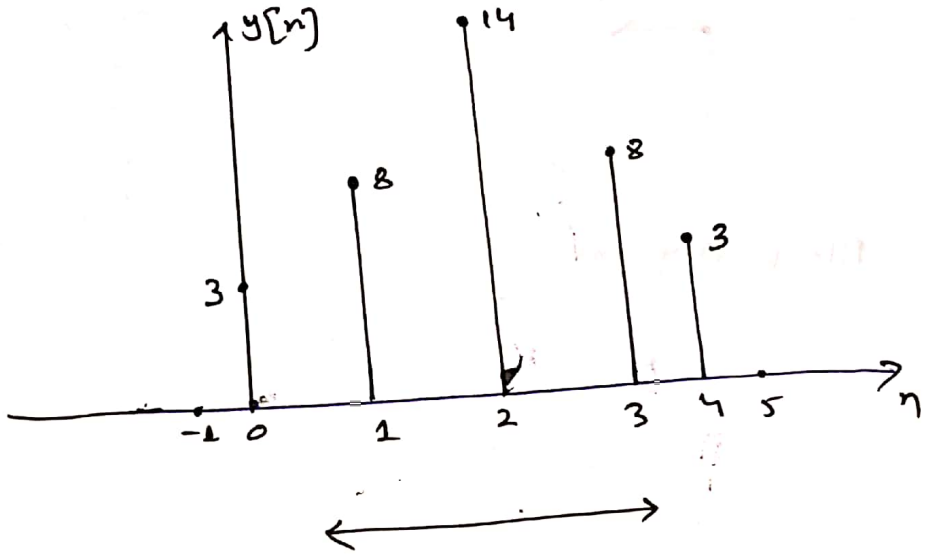
for $n>0$ There is no overlaping of the signal $x[k]$ and $h[n-k]$ hence $y[n]=0$

P.T.O

Over all output $y[n]$ can be written as

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

Graphically:



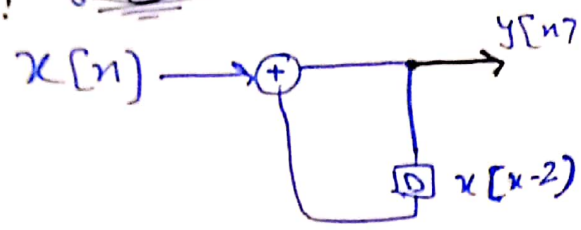
Q1 Part (b) Sketch the Digramm for given system

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

Sol:

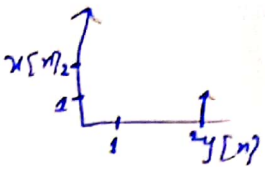
$$y[n] = x[n] + x[n-2]$$

Digram:



Block digramm

graph



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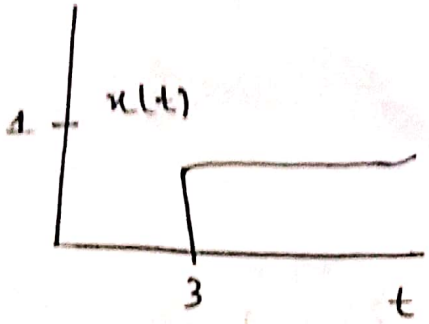
Q 2 Part (a)



i) @ x(t+5)

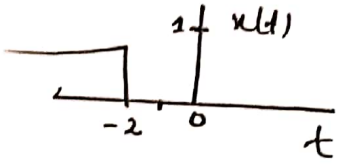
At $t = 3 \quad x(t) = 1$

At $t+5 = 3 \quad x(t+5) = 1$

$\Rightarrow t+5 = 3$

$\Rightarrow t = 3-5$

$\Rightarrow t = -2$



∵) The signal is generated to be zero for $t < -2$

(ii)

$x(3t)$

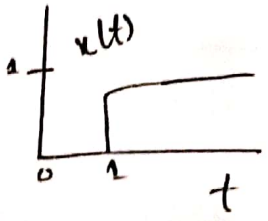
$t = 3 \quad x(t) = 1$

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

$\Rightarrow 3t = 3$

$\frac{3t}{3} = \frac{3}{3} \quad 1$

$t = 1$



∵ The signal is generated to be zero for $t < 1$

ii) (8 13746

$x(t-2)$

At

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

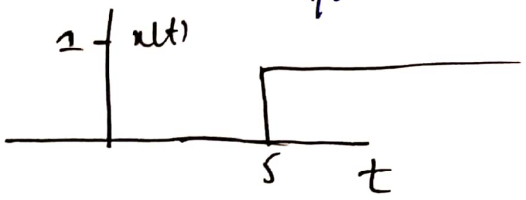
$= t-2 = 3 \quad x(t-2) = 1$

$\Rightarrow t-2 = 3$

$\Rightarrow t = 3+2$

$= t = 5$

The signal is generated to be zero for $t \geq 5$



$x(t/4)$

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

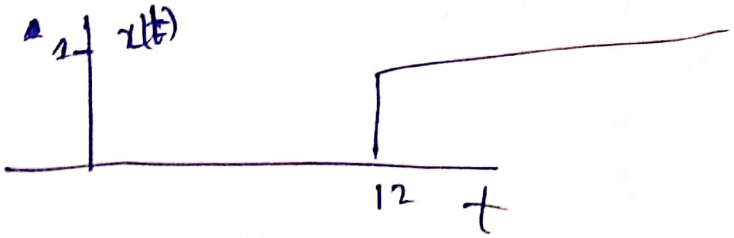
At

$t/4 = 3 \quad x(t/4) = 1$

$t = 4 \times 3$

$t = 12$

The signal is generated to be zero for $t < 12$



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Q2 Part (b

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

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

i)

ANS:

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

This system is non-invertibal because we cannot determind The sign of The input from The knowledge of out put.

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

This System is non-causal System because its out put involves future value of The input so its non-causal.

Q3: Fill blanks

'If a Time shift in The input signal result In an Identical time shift in The o/p signal The System is said to be Invariant System.