

**Sheet 4****I) Discrete Time LTI Systems:**

1- Let:

$$x[n] = \delta[n] + 2\delta[n-1] - \delta[n-3] \text{ and } h[n] = 2\delta[n+1] + 2\delta[n-1]$$

Compute and plot each of the following convolutions:

- a.  $y_1[n] = x[n] * h[n]$
- b.  $y_2[n] = x[n+2] * h[n]$
- c.  $y_3[n] = x[n] * h[n+2]$

2- Consider an input  $x[n]$  and a unit impulse response  $h[n]$  given by and output  $y(t)$  related by:

$$x[n] = \left(\frac{1}{2}\right)^{n-2} u[n-2], \quad h[n] = u[n+2]$$

Determine and plot the output  $y[n] = x[n] * h[n]$ .3- Compute and plot the convolution  $y[n] = x[n] * h[n]$ , where

$$x[n] = \left(\frac{1}{3}\right)^{-n} u[-n-1] \text{ and } h[n] = u[n-1]$$

4- Compute the convolution  $y[n] = x[n] * h[n]$  of the following pairs of signals

a.  $x[n] = h[n] = \alpha^n u[n]$

b.  $x[n] = \left(-\frac{1}{2}\right)^n u[n-4]$

$h[n] = 4^n u[2-n]$

c.  $x[n]$  and  $h[n]$  are as in the following figures

