EX.1. $h[n] = (\frac{1}{2})^{n-1} \{ u[n+3] - u[n-10] \}$

Express A, B in terms of n so that:

$$h[n-k] = \begin{cases} (\frac{1}{2})^{n-k-1} & A \leq k \leq B \\ 0 & \text{else} \end{cases}$$

EX.2. Let $x[n] = \begin{cases} 1 & 0 \leq n \leq 9 \\ 0 & \text{else} \end{cases}$

$h[n] = \begin{cases} 1 & 0 \leq n \leq N \\ 0 & \text{else} \end{cases}$ where $N \leq 9$, an integer

Determine the value of N, given that $y[n] = x[n] * h[n]$ and $y[4] = 5$, $y[14] = 0$

EX.3. A linear system has the relationship $y[n] = \sum_{k=-\infty}^{\infty} x[k] g[n-2k]$ between its input $x[n]$ and its output $y[n]$, where

$g[n] = u[n] - u[n-4]$

a) Determine $y[n]$, when $x[n] = \delta[n-1]$

b) Determine $y[n]$, when $x[n] = \delta[n-2]$

c) Is S, LTI ?

d) Determine $y[n]$ when $x[n] = u[n]$

Ex. 7. $h[k] \neq 0$ when $-3 \leq k \leq 9$

$\Rightarrow h[n-k] \neq 0$ when $-3 \leq n-k \leq 9$

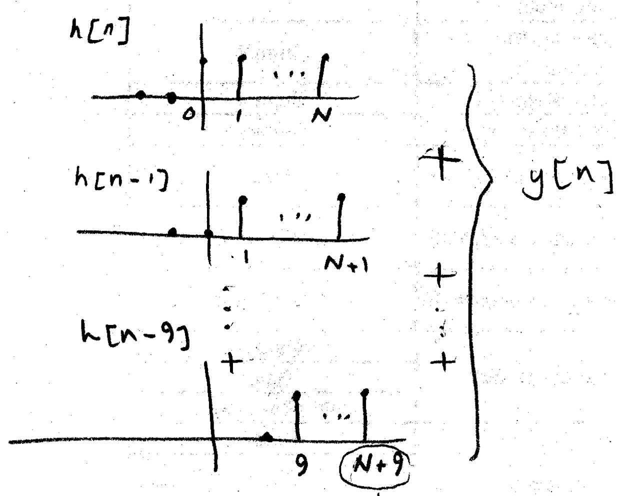
$\Rightarrow h[n-k] \neq 0$ when $-3-n \leq -k \leq -n+9$

$\Rightarrow h[n-k] \neq 0$ when $n-9 \leq k \leq n+3$

$$\Rightarrow \begin{array}{l} A = n-9 \\ B = n+3 \end{array}$$

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

$$= \sum_{k=0}^{9} 1 \cdot h[n-k] = \sum_{k=0}^{9} h[n-k]$$



$$\left.\begin{array}{l} y[N+9] \neq 0 \\ y[14] = 0 \end{array}\right\} \Rightarrow N+9 < 14 \Rightarrow N \leq 4 \quad (*)$$

$y[4] = 5 \Rightarrow$ There are at least 5 non-zero samples in $h \Rightarrow N \geq 4$ (**)

(**), (*) $\Rightarrow N = 4$

EX. 3) a) $y[n] = \sum_{k=-\infty}^{\infty} x[k]\, g[n-2k]$

Since $x[k] = \delta[n-1]$ it's non zero only at $k = 1$:

$$y[n] = g[n-2\cdot 1] = u[n-2] - u[n-6]$$

b) similar to a

$$y[n] = g[n-2\cdot 2] = u[n-4] - u[n-6]$$

c) from (a) and (b) we know the system is not time invariant. (not LTI)

d) $y[n] = \sum_{k=0}^{\infty} g[n-2k]$ (since $x[k]$ is unit step)