Parte II

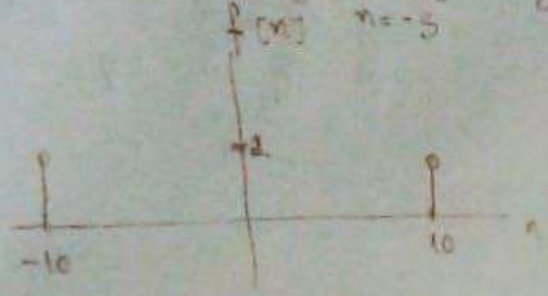
1)

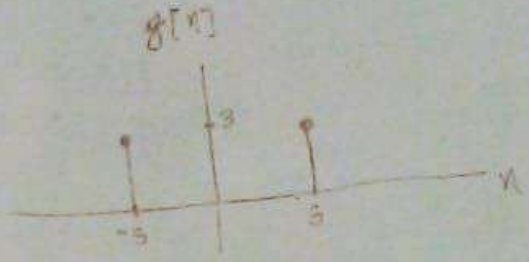
$x[n] = (f * g)[n]$

$x[n] = \sum_{k=-\infty}^{+\infty} f[k] \cdot g[n-k]$

a) $f[n] = 2\delta[n+10] + 2\delta[n-10]$ (n = -10, n = 10)

$g[n] = 3\delta[n+5] + 3\delta[n-5]$ (n = -5, n = 5)



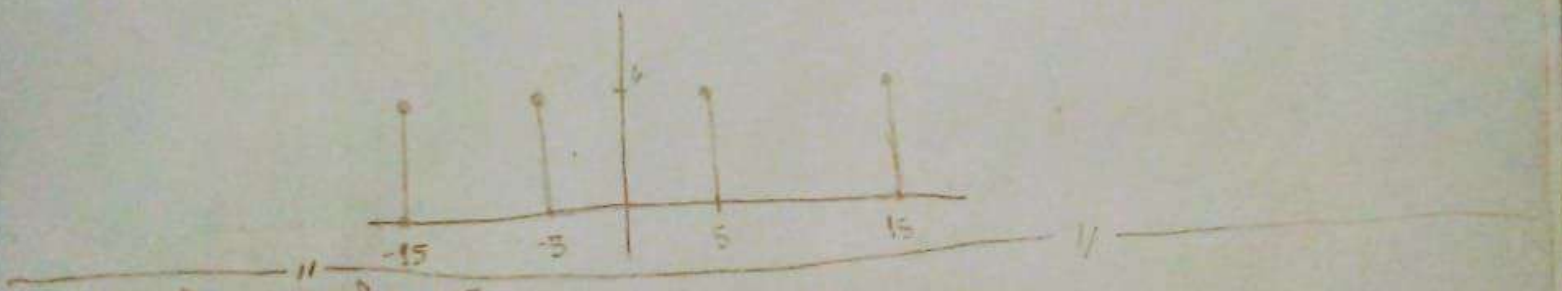


$x[n] = f[-10] \cdot g[n-(-10)] + f[-5] \cdot g[n-(-5)] + f[5] \cdot g[n-5] + f[10] \cdot g[n-10]$

$x[n] = 2 \cdot g[n+10] + 2 \cdot g[n-10]$

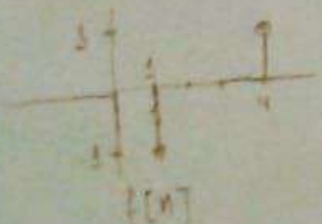
$x[n] = 2 \cdot [3(\delta[n+5+10] + \delta[n-5+10]) + 3(\delta[n+5-10] + \delta[n-5-10])]$

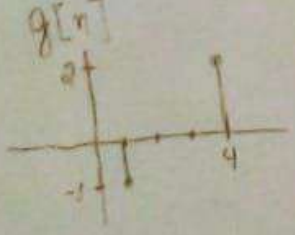
$x[n] = 6 \cdot (\delta[n+15] + \delta[n-5] + \delta[n-5] + \delta[n-15])$ (n = -15, n = 5, n = 5, n = 15)

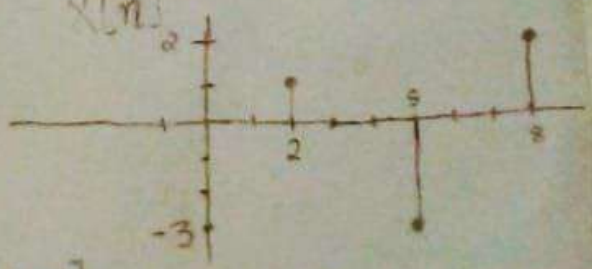


b) $f[n] = \delta[n-4] - \delta[n-1]$

$g[n] = 2\delta[n-4] - \delta[n-1]$







$x[n] = f(1) \cdot g[n-1] + f(4) \cdot g[n-4]$

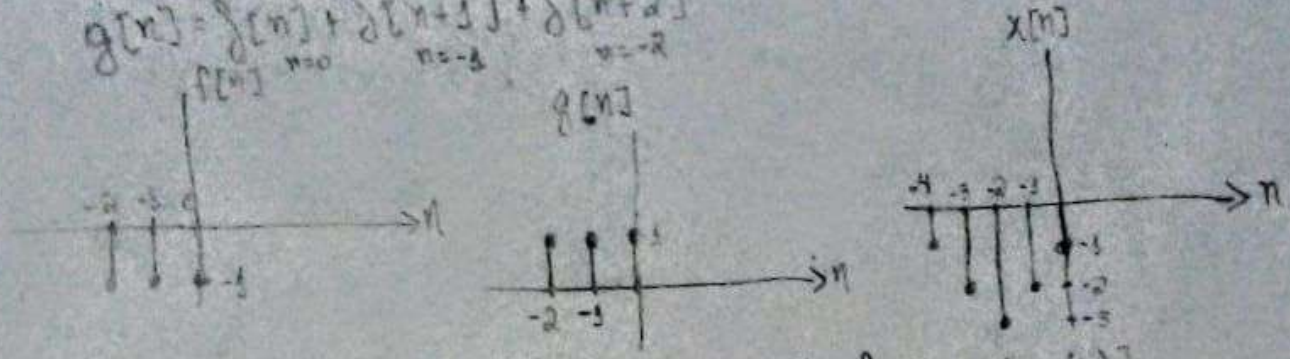
$= -1 \cdot g[n-1] + 1 \cdot g[n-4]$

$= -(2\delta[n-4-1] - \delta[n-1-1]) + (2\delta[n-4-4] - \delta[n-1-4])$

$= -2\delta[n-5] + \delta[n-2] + 2\delta[n-8] - \delta[n-5]$

c) $f[n] = -\delta[n+2] - \delta[n+1] - \delta[n]$ (n=-2, n=-1, n=0)

$g[n] = \delta[n] + \delta[n+1] + \delta[n+2]$ (n=0, n=-1, n=-2)



$x[n] = f[-2]\cdot g[n-(-2)] + f[-1]\cdot g[n-(-1)] + f[0]\cdot g[n-(0)]$

$= -g[n+2] - g[n+1] - g[n]$ (n=-2, n=-1, n=0)

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

$-(\delta[n] + \delta[n+1] + \delta[n+2])$

$= -(\delta[n+2] + \delta[n+3] + \delta[n+4]) - (\delta[n+1] + \delta[n+2] + \delta[n+3]) - (\delta[n] + \delta[n+1] + \delta[n+2])$

$x[n] = -2\delta[n+2] - 2\delta[n+3] - 2\delta[n+1] - \delta[n+4] - \delta[n]$

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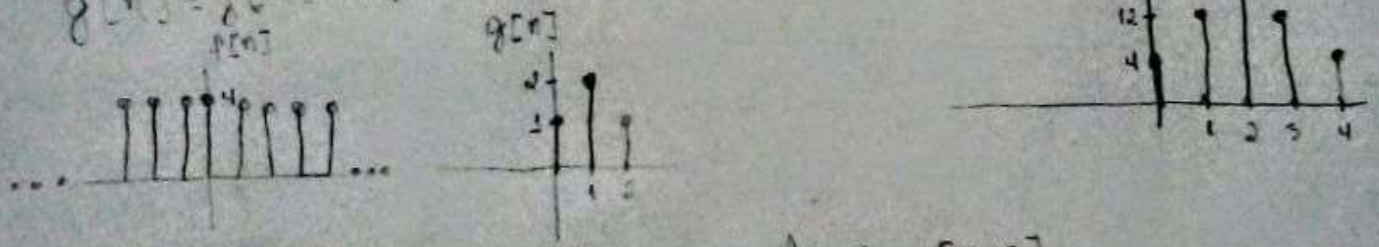
d) $f[n] = 4$

$g[n] = \delta[n] + 2\delta[n-1] + \delta[n-2]$



$x[n] = f[0]\cdot g[n-0] + f[1]\cdot g[n-1] + f[2]\cdot g[n-2]$

$= 4\cdot g[0] + 4\cdot g[n-1] + 4\cdot g[n-2]$

$= 4[(\delta[n] + 2\delta[n-1] + \delta[n-2]) + (\delta[n-1] + 2\delta[n-1-1] + \delta[n-2-1])$

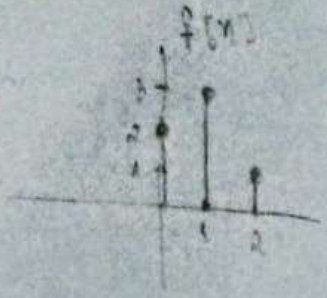
$+ (\delta[n-2] + 2\delta[n-1-2] + \delta[n-2-2])$

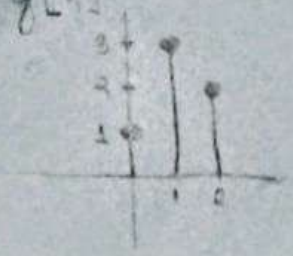
$= 4(\delta[n] + 3\delta[n-1] + 4\delta[n-2] + 3\delta[n-3] + \delta[n-4])$

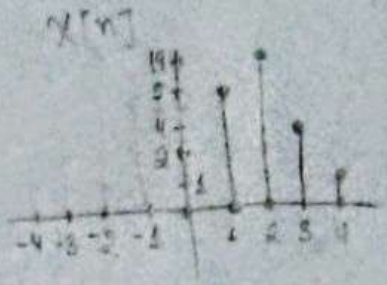
$= 4\delta[n] + 12\delta[n-1] + 16\delta[n-2] + 12\delta[n-3] + 4\delta[n-4]$

e) $f[n] = 2\delta[n] + 3\delta[n-1] + \delta[n-2]$

$g[n] = \delta[n] + 3\delta[n-1] + 2\delta[n-2]$







$x[n] = f[0] \cdot g[n] + f[1] \cdot g[n-1] + f[2] \cdot g[n-2]$

$= 2 \cdot g[n] + 3 \cdot g[n-1] + g[n-2]$

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

$= 1\delta[n-4] + 4\delta[n-3] + 14\delta[n-2] + 6\delta[n-1] + 2\delta[n]$

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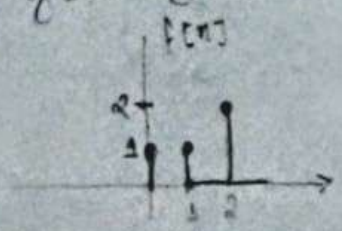
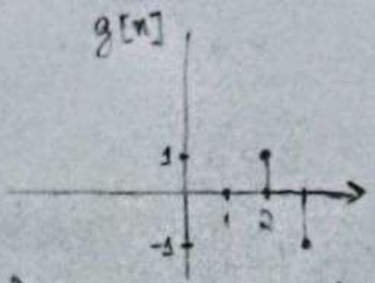
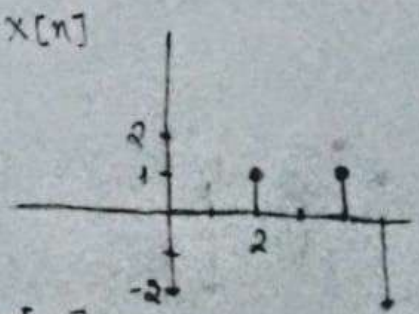
f) $f[n] = \delta[n] + \delta[n-1] + 2\delta[n-2]$

$g[n] = \delta[n-2] - \delta[n-3]$







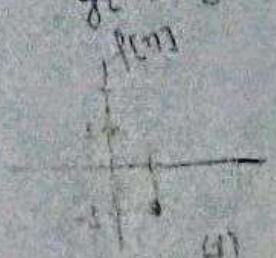
$x[n] = f[1] \cdot g[n-1] + f[2] \cdot g[n-2] + f[0] \cdot g[n]$

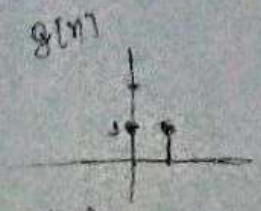
$= (\delta[n-2-1] - \delta[n-3-1]) + 2 \cdot (\delta[n-2-2] - \delta[n-3-2]) + (\delta[n-2] - \delta[n-3])$

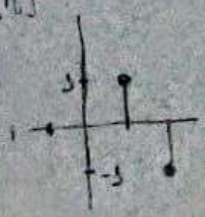
$= -2\delta[n-5] + \delta[n-4] + \delta[n-2]$

g) $f[n] = (-1)^n$

$g[n] = \delta[n] + \delta[n-1]$







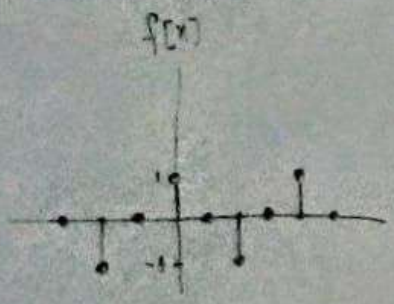
$x[n] = f[0] \cdot g[n] + f[1] \cdot g[n-1] +$

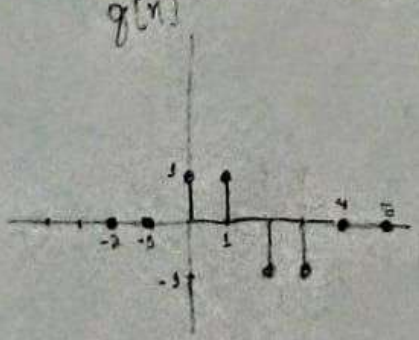
$= (\delta[n] + \delta[n-1]) - (\delta[n-1] + \delta[n-1-1])$

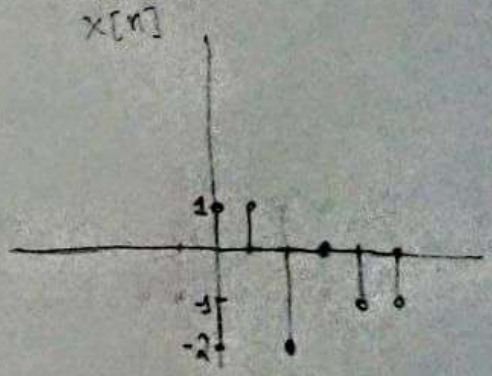
$= \delta[n] - \delta[n-2]$

h) $f[n] = \cos(\pi n/2)$

$g[n] = \delta[n] + \delta[n-1] + \delta[n-2] + \delta[n-3]$







$x[n] = f[0] \cdot g[n] + f[2] \cdot g[n-2]$

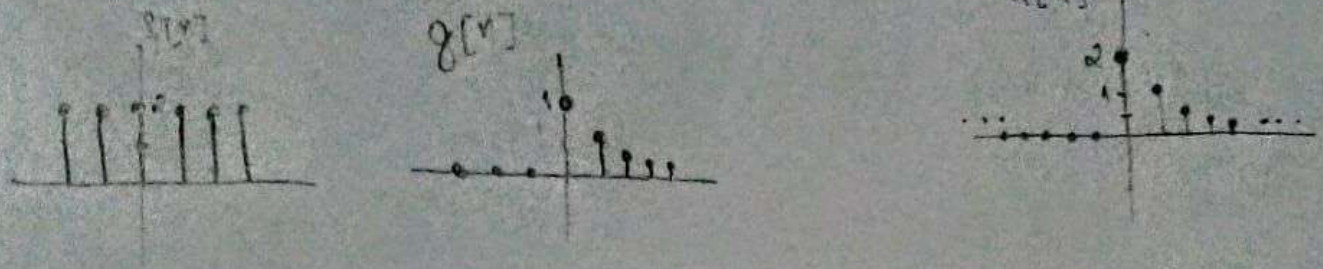
$= (\delta[n] + \delta[n-1] + \delta[n-2] + \delta[n-3]) - (\delta[n-2] + \delta[n-1-2] - \delta[n-2-2] - \delta[n-3-2])$

$= \delta[n] + \delta[n-1] - 2\delta[n-2] - \delta[n-4] - \delta[n-5]$

Cont. Convoluções
Lista I - Parte II

i) $f[n] = 2$
$g[n] = \left(\frac{1}{2}\right)^n u[n]$

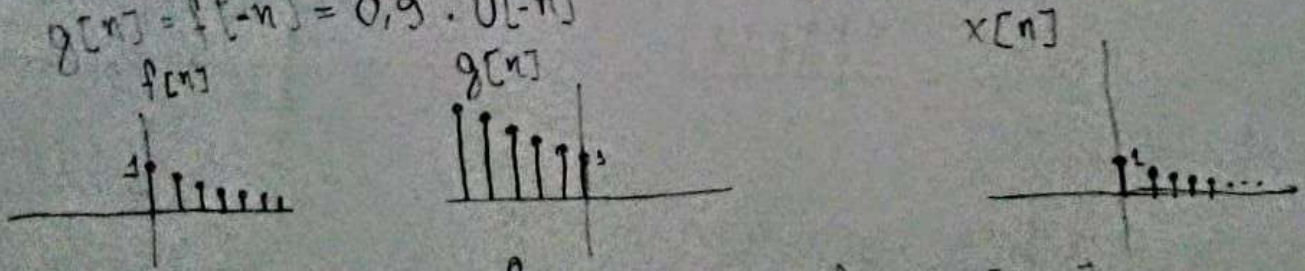
$$u[n] = \begin{cases} 0, & n < 0 \\ 1, & n \geq 0 \end{cases}$$



$$x[n] = f[0] \cdot g[n] + f[1] \cdot g[n-1] + f[2] \cdot g[n-2] + f[-1] \cdot g[n-(-1)]$$
$$= 2(1 \cdot u[n]) + 2 \cdot (0{,}5 \cdot u[n-1]) + 2 \cdot (0{,}25 \cdot u[n-2]) + 2(0{,}5 \cdot u[n+1])$$

ℓ) $f[n] = 0{,}9^n u[n]$
$g[n] = f[-n] = 0{,}9^{-n} \cdot u[-n]$

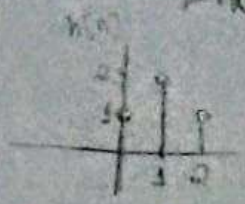
$$u[-n] = \begin{cases} 0, & n > 0 \\ 1, & n \leq 0 \end{cases}$$

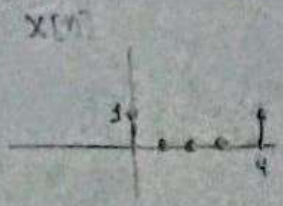


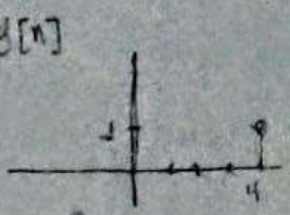
$$x[n] = f[0] \cdot g[n] + f[-1] \cdot g[n-(-1)] + f[1] \cdot g[n-1]$$
$$= 1 \cdot (0{,}9^n \cdot u[-n]) + 0{,}9 \cdot (0{,}9^{-n+1} \cdot u[-n+1])$$

K) $h[n] = \delta[n] + 2\delta[n-1] + \delta[n-2]$

$x[n] = \sum_{k=0}^{\infty} \delta[n-4k]$





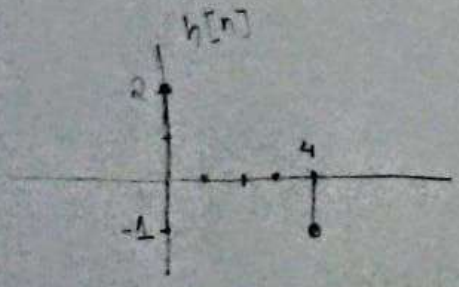


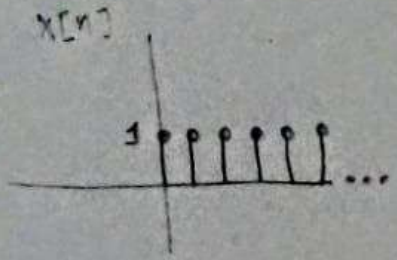
$y[n] = h[0] \cdot x[n] + h[1] \cdot x[n-1] + h[2] \cdot x[n-2]$

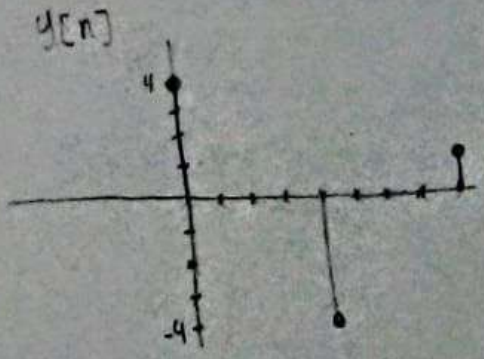
$= \delta[n-4]$

L) $h[n] = 2\delta[n] - \delta[n-4]$

$x[n] = u[n]$







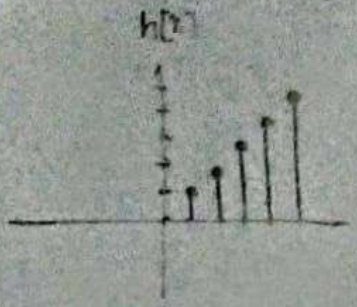
$y[n] = h[0] \cdot x[n] + h[4] \cdot x[n-4]$

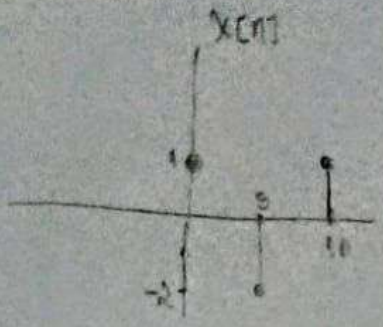
$= 2 \cdot (2\delta[n] - \delta[n-4]) - (2\delta[n-4] - \delta[n-4-4])$ (n-8)

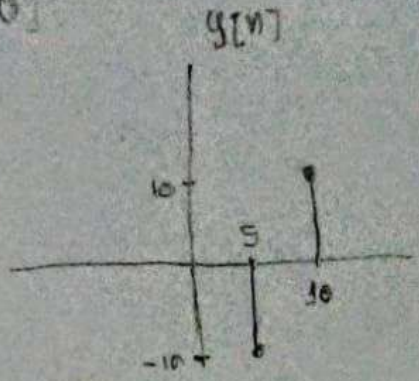
$= 4\delta[n] - 4\delta[n-4] + \delta[n-8]$

m) $h[n] = r[n]$

$x[n] = \delta[n] - 2\delta[n-5] + \delta[n-10]$





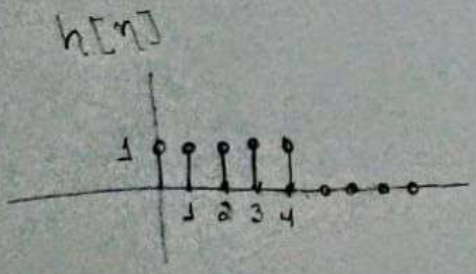


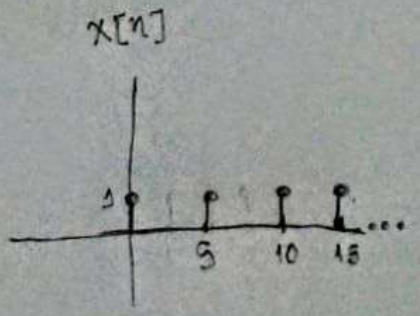
$y[n] = x[0] + h[n] + x[5] \cdot h[n-5] + x[10] \cdot h[n-10]$

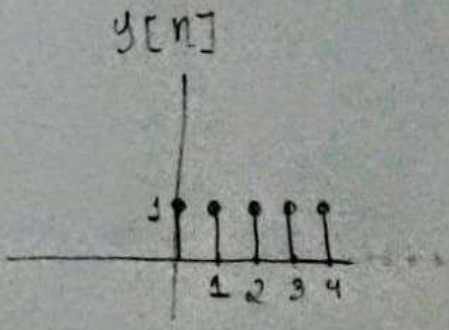
$= (n)u[n] - 2 \cdot (n-5)u[n-5] + 1 \cdot (n-10)u[n-10]$

2) $h[n] = u[n] - u[n-5]$

$x[n] = \sum_{K=0}^{\infty} \delta[n-5K] = \delta[n-$







$y[n] = h[0] \cdot x[n] + h[1] \cdot x[n-1] + h[2] \cdot x[n-2] + h[3] \cdot x[n-3]$

$+ h[4] \cdot x[n-4]$

$= \sum_{K=0}^{\infty} \delta[n-5K-1] + \sum_{K=0}^{\infty} \delta[n-5K-2] + \sum_{K=0}^{\infty} \delta[n-5K-3] + \sum_{K=0}^{\infty} \delta[n-5K-4]$

$+ \sum_{K=0}^{\infty} \delta[n-5K]$