PRO6 Montiel Cruz Jorge de Jesús

a). Se tienen las siguientes señales en tiempo discreto

$$f[n] = e^{-n}u[n] \; ; \; g[n] = 2^{-n}u[n]$$

a) Realice la convolución de las señales usando tablas de convolución

b) Realice la convolución de las señales sin usar tablas de convolución usando tablas.

$$f[n] = \left(e^{-1}\right)^n u[n] \; ; \; g[n] = \left(2^{-1}\right)^n u[n]$$

$\gamma_1 = f[n] \quad \gamma_2 = g[n]$ causales.

$$\gamma_1[n] * \gamma_2[n] = \frac{\gamma_1^{n+1} - \gamma_2^{n+1}}{\gamma_1 - \gamma_2} u[n]$$

$$\gamma_1 \neq \gamma_2$$

$$\frac{\left(e^{-1}\right)^{n+1} - \left(2^{-1}\right)^{n+1}}{e^{-1} - 2^{-1}} = \frac{e^{-n-1} - 2^{-n-1}}{\frac{1}{e} - \frac{1}{2}} = \frac{e^{-n}e^{-1} - 2^{-n}2^{-1}}{\frac{2-e}{2e}}$$

$$= \frac{2e\left(e^{-n}e^{-1} - 2^{-n}2^{-1}\right)}{2-e} = \frac{2}{2-e}\left(e^{-n} - \frac{e}{2}2^{-n}\right)u[n]$$

B.) $f[n] * g[n] = \sum_{m=0}^{n} f[m]\, g[n-m]$

$= \sum_{m=0}^{n} e^{-m} 2^{-(n-m)} = 2^{-n} \sum_{m=0}^{n} \left(\frac{2}{e}\right)^{m}$ usando $\sum_{m=0}^{n} a^m = \frac{1-a^{n+1}}{1-a}$

* causales

$= 2^{-n}\left(\frac{1-\left(\frac{2}{e}\right)^{n+1}}{1-\frac{2}{e}}\right) = 2^{-n}\left(\frac{e\left(\frac{2}{e}\right)^{n+1} - e}{2-e}\right) = \frac{2^{-n}}{2-e}\left(2^{n+1} e^{-n} - e\right)$

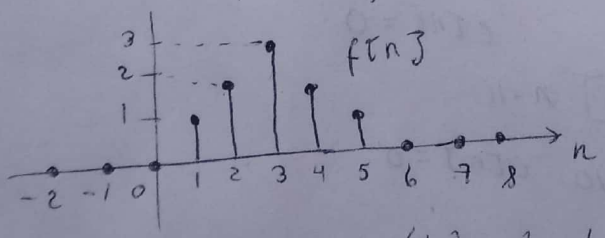
$= \frac{1}{2-e}\left(2e^{-n} - 2^{-n} e\right) = \frac{2}{2-e}\left(e^{-n} - \frac{e}{2} 2^{-n}\right)$

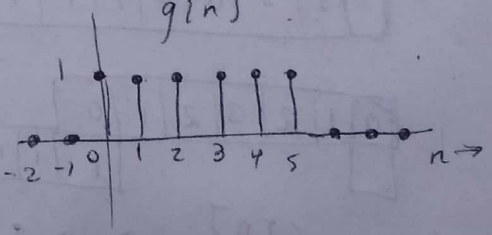
$c[n] = f[n] * g[n] = \frac{2}{2-e}\left[e^{-n} - \frac{e}{2} 2^{-n}\right] u[n]$

b) Realice la convolución de las siguientes señales

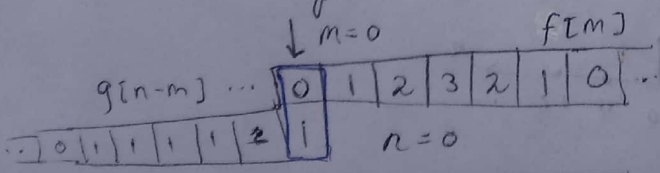
$$f[n] = \begin{cases} n & \text{si } n \in \{1,2,3\} \\ -n+6 & \text{si } n \in \{4,5,6\} \\ 0 & \text{otro caso} \end{cases} \quad ; \quad g[n] = \begin{cases} 1 & \text{si } 0 \le n \le 5 \\ 0 & \text{otro caso} \end{cases}$$

$c[n] = f[n] * g[n]$

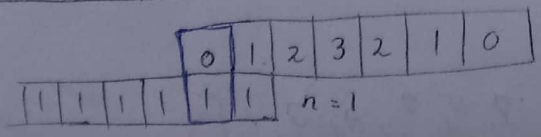




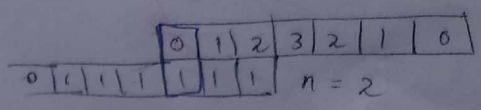
por el método de la cinta transportadora



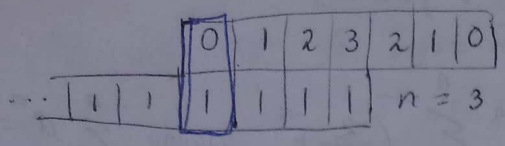
$c[0] = 0.$



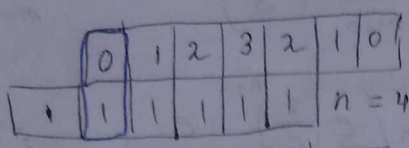
$c[1] = 1.$



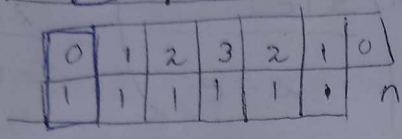
$c[2] = 3$



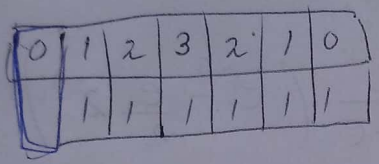
c[3] = 6



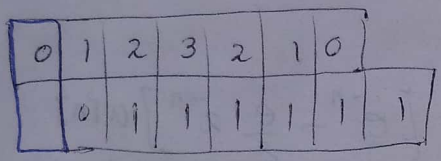
c[4] = 8



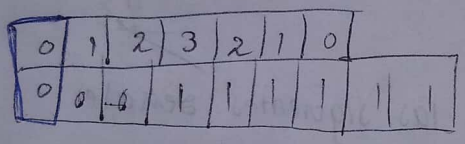
c[5] = 9



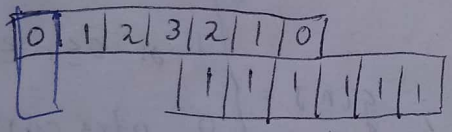
c[6] = 9



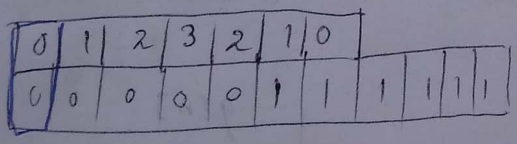
c[7] = 9



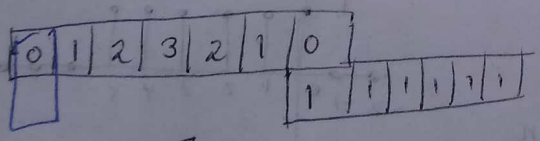
c[8] = 7



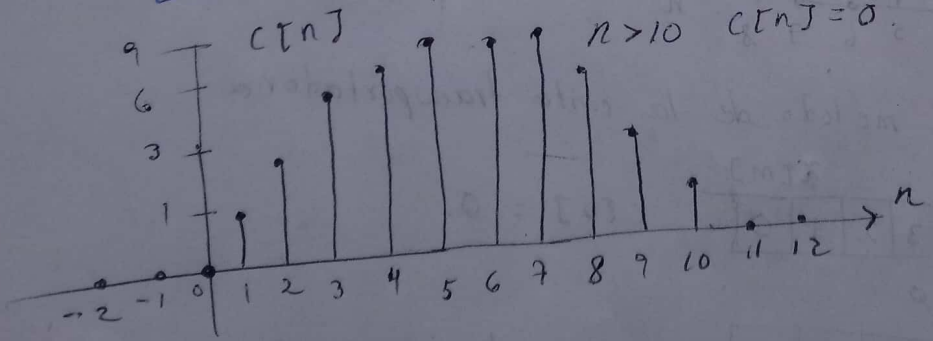
c[9] = 3



c[10] = 1



c[11] = 0



$c[n] = \{0, 1, 3, 6, 8, 9, 9, 9, 7, 3, 1\}$

↑ n=0