تمرین دوم

Subject: Year: Month: Day: ( )

-1

الف) $y_1[n] = x[n] * h[n]$

ب) $y_2[n] = x[n+2] * h[n]$

ج) $y_3[n] = x[n] * h[n+2]$

الف) $y_1[n] = \sum_{k=-\infty}^{\infty} h[k]\, x[n-k]$

$y_1[n] = h[-1]\, x[n+1] + h[n]\, x[n-1]$

$\Rightarrow 2x[n+1] + 2x[n-1]$

$y_1[n] = 2\delta[n+1] + 4\delta[n-1] + 2\delta[n+1] - 2\delta[n-2]$

$y_2[n] = y_1[n+2] \qquad y_1[n] = x[n] * h[n]$

$\Rightarrow \sum_{k=-\infty}^{+\infty} x[n]\, h[n-k]$

$y_3[n] = y_1[n+2]$

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$$h[k] = \left(\frac{1}{2}\right)^{k-1} \{u[k+3] - u[k-10]\}$$

$A = n-9 \qquad B = n+3$

3

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

$h[n] = u[n] \qquad y[n] = x[n] * h[n]$

$$\Rightarrow x_1[n-2] * h[n+2] \Rightarrow \sum_{k=-\infty}^{\infty} x_1[k-2]\,h_1[n-k+2]$$

$$y[n] = x_1[n] * x_1[n] * h_1[n]$$

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

4

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

$$y[n] = x[3]h[n-3] + x[4]h[n-4] + x[5]h[n-5]$$

$$+ x[6]h[n-6] + x[7]h[n-7] + x[8]h[n-8]$$

$$y[n] = \begin{cases} n-6 & 7 \le n \le 11 \\ 6 & 12 \le n \le 18 \\ 24-n & 19 \le n \le 23 \\ 0 & \text{جاهای دیگر} \end{cases}$$

Azin

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$$y[n] = \sum_{k=0}^{9} x[k]\,h[n-k] = \sum_{k=0}^{9} h[n-k \qquad (5$$

$N = 4$

$$y[n] = x[n] * h[n] = \sum_{k=-\infty}^{+\infty} x[k]\,h[n-k] \qquad (6$$

$$\Rightarrow \sum_{k=-1}^{\infty} \left(\frac{1}{3}\right)^{k} u[n+k-1]$$

$$y[n] = \sum_{p=0}^{\infty} \left(\frac{1}{3}\right)^{p+1} u[n+p]$$

$$y[n] = \begin{cases} \frac{3^{n}}{2} & n > 0 \\ \frac{1}{2} & n \cancel{\geq} 0 \end{cases}$$

$$y[n] = \sum_{k=-8}^{\infty} x[n]\,g[n-2k] \qquad (7$$

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

$$y[n] = \sum_{-\infty}^{+\infty} x[k]\,g[n-2k] = g[n-4]$$

$$\Rightarrow u[n-4] - u[n-8]$$

(8

$$x(t) * h(t) = \int_{-\infty}^{+\infty} x(\tau) h(t-\tau) d\tau$$

$$\Rightarrow \int_{-\infty}^{+\infty} h(\tau) x(t-\tau) d\tau$$

$$h(t) = \delta(t+2) + 2\delta(t+1)$$

$$y(t) = \begin{cases} t+3 & -2 < t \leq -1 \\ t+4 & -1 t \leq 0 \\ 2-2t & 0 < t \leq 1 \\ 0 & b \end{cases}$$

(9

$$h(\tau) = e^{2\tau} u(-\tau+4) + e^{-\tau} u(\tau-5)$$

$$\Rightarrow \begin{cases} e^{-2\tau} & \tau > 5 \\ e^{2\tau} & \tau > 4 \\ 0 & 4 < \tau < 5 \end{cases}$$

$$h(-\tau) = \begin{cases} e^{2\tau} & \tau > -5 \\ e^{-2\tau} & t > -4 \\ 0 & -5 < \tau -4 \end{cases}$$

$A = \tau - 5$ $B = t - 4$

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$$y(t) = \begin{cases} t & 0 \leq t \leq a \\ a & a \leq t \leq 1 \\ 1 + a - t & 1 \leq t \leq 1 + a \\ 0 & \text{دیگر} \end{cases}$$

$\alpha = 1$

11

12

$$y(t) = \dots + e^{-(t-6)} u(t+6) + e^{-(t+3)} \dots$$

$$e^{-t}(1 + e^{-3} + e^{-6} + \dots) = e^{-t} \frac{1}{1 - e^{-3}} \Leftarrow 0 \leq t < 3$$

13

$$\left(\frac{1}{5}\right)^{n} u[n] - A\left(\frac{1}{5}\right)^{n-1} u[n-1] = \delta[n]$$

$A = \frac{1}{3}$

(13

$$h[n] - \frac{1}{5} h[n-1] = \delta[n]$$

$$h[n] * \left(\delta[n] - \frac{1}{5} \delta[n-1] \right) = \delta[n]$$

$$g[n] = \delta[n] - \delta[n] - \frac{1}{2} \delta[n-1]$$

(14

$$\int_{-\infty}^{+\infty} |h_1(\tau) \, d\tau = \int_0^{\infty} e^{-\tau} d\tau = 1$$

$$\int_{-\infty}^{+\infty} |h_2(\tau)| \, d\tau = \int_0^{\infty} e^{-\tau} |\cos 2t| \, d\tau$$

پایدار LTI

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