Subject:
Date

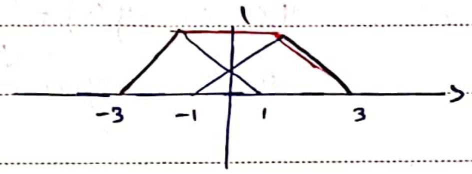
Keivan Ipchi Hagh

1. $x(t) = u(t) - u(t-4)$ ①

$\text{Even}\{x(t)\} = \dfrac{x(t) + x(-t)}{2}$

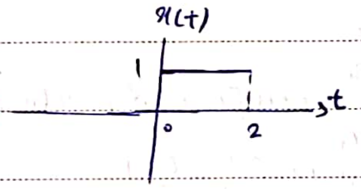
داریم: $x(-t) = x(t+2)$

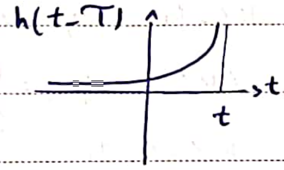
$y_1(t) = \dfrac{y(t) + y(t+2)}{2}$ ① $\longrightarrow \dfrac{u(t) - u(t-4) + u(t+2) - u(t-2)}{2}$



2.

a)



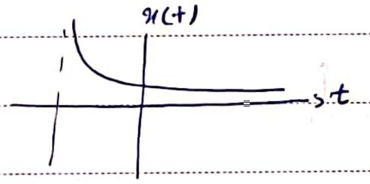


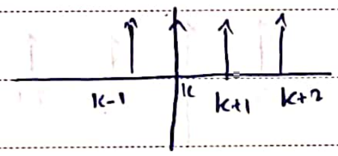
$t < 0 \rightarrow y = 0$

$0 < t < 2 \rightarrow y = \int_0^t e^{-2t} dt = \frac{1}{2}(1 - e^{-2t})$

$t \geq 2 \rightarrow y = \int_0^2 e^{-2(t-T)} d_T = \frac{1}{2}\left(e^{2(2-t)} - e^{-2t}\right)$

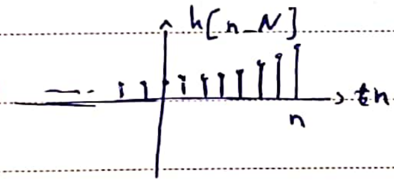
b)

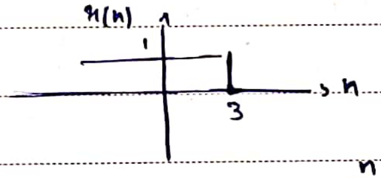




$x(t) * h(t) = \sum_{k-1}^{k+2} 3^{-n}(4k+2)$

c)

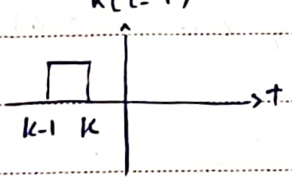


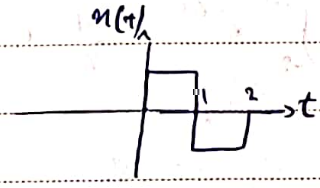


$n < 3 \rightarrow y[n] = \sum_{k=-\infty}^{n} 5^{-(n-N)} \cdot x[k]$

$n \geq 3 \rightarrow y[n] = \sum_{k=-\infty}^{3} 5^{-(n-k)} \cdot x[k]$

d)





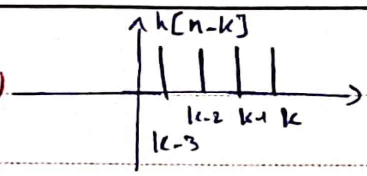
$0 < t$ or $t > 3 \rightarrow y = 0$

$0 < t < 1 \rightarrow y(t) = t$

$1 < t < 2 \rightarrow y(t) = \int_{t-1}^{1} d_T + \int_1^t d_T = 3 - 2t$

$2 < t < 3 \rightarrow y(t) = t - 3$

PAPCO

e) 

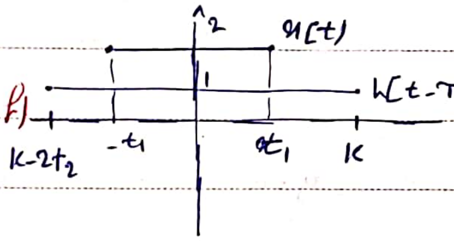
$k-3 \geq 3$ or $k < -1 \rightarrow y(t) = 0$

$0 < k < 2 \rightarrow y(t) = \int^{k} \sum_{0}^{2} x[k]h(n-k]$

$k = 3 \rightarrow y(t) = 8$

$4 \leq k < 6 \rightarrow y[n] = \sum_{k=3}^{6} x[k]\, h[n-k]$

$k \geq 7 \rightarrow y(t) = 0$

f) 

$k < -t_1 \rightarrow y(t) = 0$

$-t_1 < k < t_1 \rightarrow y(t) = \int_{-t_1}^{k} x(t)h[t-T]\,dT = 2(k+t_1)$

$t_1 < k < 2t_2 - t_1 \rightarrow y(t) = 2(2t_1)$

$2t_2 - t_1 < k < 2t_2 + t_1 \rightarrow y(t) = \int_{k-2t_2}^{t_1} x(t)h(t-T)\,dT = 2(t_1 - k + 2t_2)$

$k > t_1 + 2t_2 \rightarrow y = 0$

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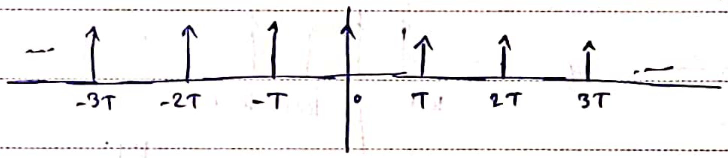
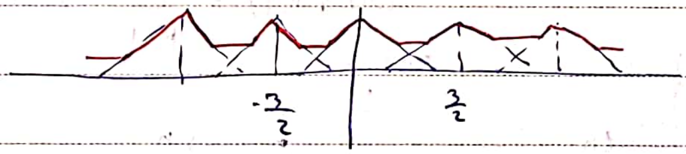
ب) 

ج) $T = \frac{3}{2}$ 

4

a) $h(t=-1) = e^{6}u(1) \neq 0$ علّی نیست

$\int_{-\infty}^{\infty} e^{-6t} u(t+2) \xrightarrow{t>-2} \int_{-2}^{\infty} e^{-6t} = \frac{-1}{6} e^{-6t}\Big|_{-2}^{\infty} < \infty$ پایدار است

b) $h(n=-1) = 2^{-1} u(4) \neq 0$ علّی نیست

$\sum_{-\infty}^{\infty} 2^{n} u[3-n] = \sum_{-\infty}^{3} 2^{n} < \infty$ پایدار است

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c)

$$h(t) = (t-T)u(t-T) \rightarrow h(t=-1) = (-1-T)u(-1-T) \neq 0$$ علی است

$$\int_{-\infty}^{\infty} (t-T)u(t-T)\,dT$$

d) $h[-1] = 0.8^{-1} \neq 0$ علی نیست

$$\sum_{-\infty}^{\infty} (0.8)^n = \sum_{-2}^{\infty} (0.8)^n = 2.8 + \frac{1}{0.2} < \infty$$ پایدار است

5)

آ) $z[n] = x[n] + \frac{1}{2} z[n-1] \Rightarrow x[n] = z[n] - \frac{1}{2} z[n-1]$

ب) $x(n) = \delta[n] \longrightarrow z[n] = \frac{1}{2} z[n-1] + \delta[n] \rightarrow n=0 \rightarrow z[0]=1$

$n=1 \rightarrow z = \frac{1}{2}$

$n=2 \rightarrow z = \frac{1}{4}$

$n \rightarrow z = \frac{1}{2^n}$

$$h_2(n) = \begin{cases} 0 & n<0 \\ \frac{1}{2^n} & n \geq 0 \end{cases}$$

ج) $y[n] = z(n-1) + \frac{1}{2} z(n)$

6) $y[n]=0 \Leftarrow \delta[n]=0$

$n=0 \rightarrow y[0] - 2y[-1] = \delta[0] \rightarrow y[0]=1$

$n=1 \rightarrow y[1] + 2y[0] = \delta[1] \rightarrow y[1] = -2$

$n=2 \rightarrow y[2] + 2y[1] = \delta[2] \rightarrow y[2] = +4$

$$y[n] \begin{cases} 0 & n<0 \\ (-2)^n & n \geq 0 \end{cases}$$