

ELM 367 Ödev IV

"Ödevi başka bir öğrenciden kopyaladım. Kendim yaptım."

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Soru 1)

20. a) $y[n] = (1/a)y[n-1] + x[n-1]$

$$h[0] = 0 \rightarrow n < 0 \Rightarrow h[a] = 0$$

$$h(\mathcal{O}) = 1$$

$$h(2) = 1/9$$

$$h[x] = (1/c)^2$$

$$h[n] = (1/a)^{n-1} u[n-1]$$

20.5) HCl sulu çözeltiyon sonuza getiriyor.

range $\Rightarrow |1/a| < 1 \quad |a| \geq 1$

50Ru 2)

30. a) $y[n] = x_1[n] * x_2[n]$

$$w(\omega) = x(\omega) * h_1(\omega)$$

$$\psi(C_n) = \sum_{k=-\infty}^{\infty} \chi(C_k) h_1(C_n - k)$$

$$= \sum_{k=0}^n (-1)^k u_k h_1(h-k) = \sum_{k=0}^n (-1)^k h_1(h-k)$$

$$k \leq 0 \Rightarrow w(F) = 0$$

$$k \geq 3 \Rightarrow w[n] =$$

$$k=0 \Rightarrow w_G = 1$$

$$k=1 \Rightarrow w[1]=0$$

$$k=2 \Rightarrow W(2)=1$$

$$y[n] = w[n] * h_2[n]$$

$$= \sum_{k=-\infty}^{\infty} h_2[k] w[n-k] \Rightarrow$$

$$n \geq 2 \Rightarrow \omega = 0$$

$$y[3] = 1$$

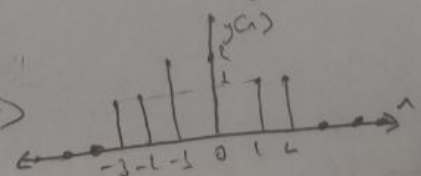
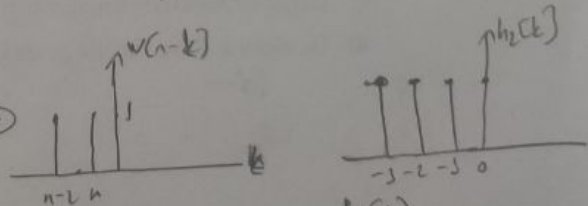
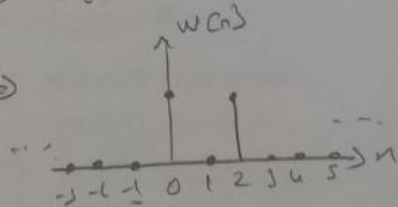
$$y(-2) = 1$$

$$yC-13=2$$

$$y(0) = 2$$

$$y(1) = 1$$

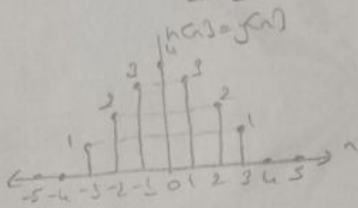
$$J(z) =$$



SORU 2)

$$30.b) h[n] = h_1[n] * h_2[n]$$

$$= \sum_{k=-\infty}^{\infty} h_2[k] h_1[n-k]$$

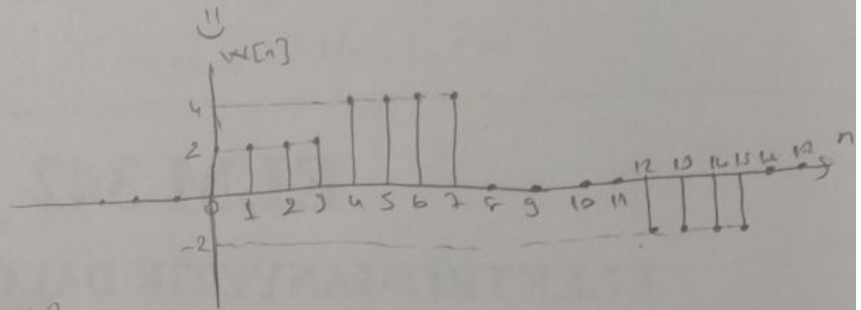


$$30.c) x[n] = 2\delta[n] + 4\delta[n-4] - 2\delta[n-12]$$

$$w[n] = x[n] * h_1[n]$$

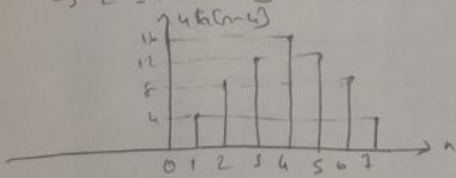
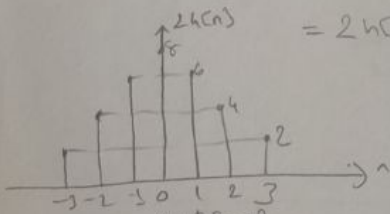
$$= \underbrace{2\delta[n] * h_1[n]}_{2h_1[n]} + \underbrace{4\delta[n-4] * h_1[n]}_{4h_1[n-4]} - \underbrace{2\delta[n-12] * h_1[n]}_{2h_1[n-12]}$$

$$= 2h_1[n] + 4h_1[n-4] - 2h_1[n-12]$$

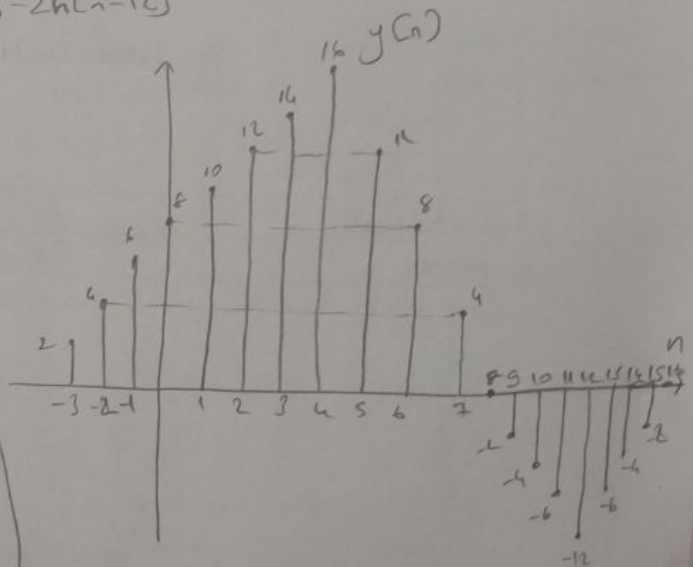
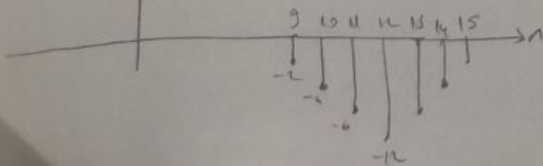


$$30.d) y[n] = w[n] * h_2[n]$$

$$= 2w[n] + 4w[n-4] - 2w[n-12]$$



$-2w[n-12]$



SORU 3)

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

$$b) H(e^{j\omega}) = \sum_{n=-\infty}^{\infty} h[n] e^{-j\omega n}$$

$$H(e^{j\omega}) = -2 + 4e^{-j\omega} - 2e^{-2j\omega}$$

$$= -2(1 - 2e^{-j\omega} + e^{-2j\omega})$$

$$H(e^{j\omega}) = -2e^{-j\omega} \left(\frac{e^{j\omega} + e^{-j\omega}}{2} \cdot 2 - 2 \right)$$

$$= 4e^{-j\omega} \underbrace{(\cos(\omega) + 1)}_{2\sin^2(\omega/2)} = 8e^{-j\omega} \sin^2(\omega/2)$$

$$c) x_1[n] = 1 + e^{j\frac{\pi}{2}n} \Rightarrow x_1[n] = e^{j0} + e^{j\frac{\pi}{2}n}$$

$$y[n] = H(e^{j\omega}) e^{j0n} + H(e^{j\omega}) x_1[n]$$

$$y[n] = 0 + 8\sin^2(\frac{\omega}{2}) e^{-j\omega} e^{j\frac{\pi}{2}n}$$

$$y[n] = 8\sin^2(\frac{\pi}{4}) e^{-j\frac{\pi}{2}} e^{-j\frac{\pi}{2}n}$$

$$= 8 \cdot \left(\frac{1}{2}\right)^2 e^{j\frac{\pi}{2}(n-1)}$$

SORU 4)

$$a) h_2[n] = \frac{2\sin(\frac{\pi}{2}n)}{\pi n}$$

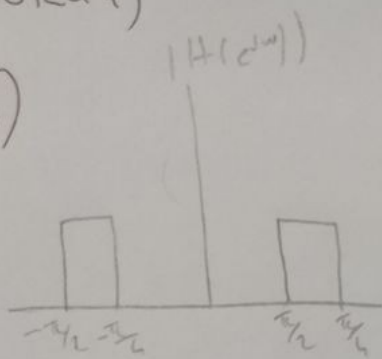
$$H(e^{j\omega}) = \begin{cases} 2 & \omega < \pi/2 \\ 0 & \pi/2 < \omega \leq \pi \end{cases}$$

$$H_1(e^{j\omega}) = e^{j\omega} \begin{cases} 0 & |\omega| \leq 0,25\pi \\ 1 & 0,25\pi < |\omega| < \pi \end{cases}$$

$$\Rightarrow H(e^{j\omega}) = e^{j\omega} \begin{cases} 0 & |\omega| < \pi/4 \\ 2 & \pi/4 < |\omega| < \pi/2 \\ 0 & \pi/2 < |\omega| \leq \pi \end{cases}$$

Soru 4)

b)



Soru 5)

a) $(1/2)^n u[n] \Rightarrow \sum_{n=0}^{\infty} (1/2)^n z^{-n} = \frac{1}{1 - 1/2z}$ $ROC = |z| > 1/2$

b) $-(1/2)^n u[n-2] \Rightarrow -\sum_{n=-\infty}^{\infty} (1/2)^n u[n-2] z^{-n} \Rightarrow \sum_{n=-\infty}^{\infty} (1/2)^{n+2} = \frac{-z^2}{1 - 1/2z} = \frac{1}{1 - 1/2z}$

c) $(1/2)^n u[-n] \Rightarrow \sum_{n=-\infty}^{\infty} (1/2)^n z^{-n} = \frac{1}{1 - 2z}$ $ROC = |z| < 1/2$

d) $\delta[n] = \sum_{n=-\infty}^{\infty} \delta[n] z^{-n} \Rightarrow z = 1$ $ROC = |z| > 0$

e) $\delta[n-1] = \sum_{n=-\infty}^{\infty} \delta[n-1] z^{-n} \Rightarrow z = 1/2$ $ROC = |z| > 0$

f) $\delta[n+1] = \sum_{n=-\infty}^{\infty} \delta[n+1] z^{-n} \Rightarrow z = 2$ $ROC = |z| < 0$

g) $(1/2)^n (u[n] - u[n-1]) \Rightarrow \sum_{n=-\infty}^{\infty} (1/2)^n (u[n] - u[n-1]) z^{-n} = \sum_{n=0}^{\infty} (1/2)^n z^{-n}$

$$= \frac{1 - (1/2)^{\infty}}{1 - 1/2z}$$

$$ROC = |z| < 0$$