Sinyaller ve Sistemler Final Ödevi

İbrahim ÇAKAR

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Soru 1)

$$\tau \operatorname{sinc}\left[\frac{\tau t}{2\pi}\right] \longleftrightarrow 2\pi P_\tau(\omega)$$

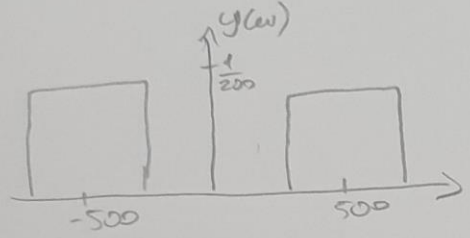
sinc 100t

$$\frac{\tau t}{2\pi} = 100t \Rightarrow \tau = 2\pi \times 100$$

$$x(t) = \operatorname{sinc} 100t = \frac{\tau}{\tau} \operatorname{sinc} 100t = \overbrace{\frac{2\pi\times 100}{2\pi\times 100} \operatorname{sinc}(100t)}^{2\pi P_{2\pi\times 100}(\omega)}$$

$$x(t) = \frac{2\pi P_{2\pi\times 100}(\omega)}{2\pi \times 100} = \frac{1}{100} \cdot P_{2\pi\times 100}(\omega) \longleftrightarrow X(\omega)$$

$$y(\omega) = \frac{1}{2} \cdot \frac{1}{100} \left[P_{2\pi\times 100}(\omega+500) + P_{2\pi\times 100}(\omega-500) \right]$$



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Soru 2) $2y[n] - 3y[n-1] + \frac{1}{4}y[n-2] = x[n] - 2x[n-1]$

$$2 \cdot y(\Omega) - \frac{3}{2}e^{-j\Omega}y(\Omega) + \frac{1}{4}e^{-j2\Omega}y(\Omega) = x(\Omega) - 2e^{-j\Omega}x(\Omega)$$

$$y(\Omega)\left(2 - \frac{3}{2}e^{-j\Omega} + \frac{1}{4}e^{-j2\Omega}\right) = x(\Omega)\left(1 - 2e^{-j\Omega}\right)$$

$$\frac{y(\Omega)}{x(\Omega)} = H(\Omega) \Rightarrow \frac{1-2e^{-j\Omega}}{2 - \frac{3}{2}e^{-j\Omega} + \frac{1}{4}e^{-j2\Omega}}$$

$e^{-j\Omega} = x$ olsun

$$= \frac{1-2x}{2 - \frac{3x}{2} + \frac{1}{4}x^2} = \frac{4(1-2x)}{x^2-6x+8} = \frac{4-8x}{x^2-6x+8}$$

$$\frac{4-8x}{(x-4)(x-2)} = \frac{A}{(x-4)} + \frac{B}{(x-2)} \Rightarrow Ax - 2A + Bx - 4B = 4 - 8x$$

$$\begin{aligned} 2/\ A + B &= -8 \\ -2A - 4B &= 4 \\ \hline -2B &= -12 \\ \boxed{B = 6} \end{aligned}$$

$$A + 6 = -8 \qquad \boxed{A = -14}$$

$$H(\Omega) = \frac{-14}{e^{-j\Omega}-4} + \frac{6}{e^{-j\Omega}-2}$$

a) $H(\Omega) = \frac{14}{4}\left(\frac{1}{1-\frac{1}{4}e^{-j\Omega}}\right) - \frac{6}{2}\left(\frac{1}{1-\frac{1}{2}e^{-j\Omega}}\right)$

b) $H[n] = \left(\frac{7}{2}\right)\cdot\left(\frac{1}{4}\right)^n u[n] - 3\cdot\left(\frac{1}{2}\right)^n u[n]$

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$\boxed{\text{Soru 3)}}$

Gerilim bölücü kuralından;

$$x(t) = 2 \cdot e^{-t} u(t)$$

$$\mathcal{L}\{x(t)\} = 2 \cdot \frac{1}{s+1}$$

$$y(s) = \frac{1/cs}{R + Ls + 1/cs} \cdot x(s)$$

$$= \frac{20/s}{16 + 4s + 20/s} \cdot x(s) = \frac{20/s}{(16 + 4s + 20/s)} \cdot \frac{2}{s+1} = \frac{40/s}{(s+1)(16 + 4s + 20)} \cdot \frac{s}{s}$$

$$= \frac{40}{(s+1)(4s^2 + 16s + 20)} = \frac{10}{(s+1)(s^2 + 4s + 5)}$$

$$Y(s) = \frac{A}{(s+1)} + \frac{Bs + C}{s^2 + 4s + 5} \Rightarrow A \cdot (s^2 + 4s + 5) + (Bs + c)(s+1) = 10$$

$s = 1$ için; $2A = 10 \Rightarrow \boxed{A = 5}$

$s = 0$ için; $5A + C = 10 \Rightarrow \boxed{C = -15}$

$s = 2$ için; $13A + 6B + 3C = 10 \Rightarrow \boxed{B = -15}$

$$Y(s) = \frac{5}{s+1} + \frac{-15s - 15}{s^2 + 4s + 5} = \frac{5}{s+1} - 15 \frac{s+1}{(s+2)^2 + 1}$$

$$= \frac{5}{s+1} - 15 \left[\frac{s+2}{(s+2)^2 + 1} + \frac{5}{(s+2)^2 + 1} \right]$$

$$y(t) = 5e^{-t} u(t) - 15 \left(e^{-2t} \cos(t)\, u(t) - e^{-2t} \sin(t)\, u(t) \right)$$

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İbrahim ÇAKAR

$\boxed{\text{Soru 4)}}$

$y(0) = -\overset{-1}{y(-1)} + 6\overset{6.5/6}{y(-2)} + \overset{1}{u(0)} + \overset{0}{u(-1)} = 5$

$y(1) = \underbrace{-y(0)}_{-5} + 6y(-1) + u(1) + u(0) = 1$

$-5 + 6.1 + 1 + 1$

$y(n) = -y(n-1) + 6y(n-2) + x(n) + x(n-1)$

$y(2) = -y(1) + 6y(0) + u(2) + u(1) = 30$

$-1 + 6.5 + 1 + 1 =$

$y(3) = -y(2) + 6y(1) + u(3) + u(1) = -22$

$-30 + 6.1 + 1 + 1$

$y(\omega) + z^{-1} y(\omega) - 6 z^{-2} y(\omega) = x(\omega) + z^{-1} x(\omega)$

$y(\omega) \cdot [1 + z^{-1} - 6z^{-2}] = x(\omega) \cdot [1 + z^{-1}]$

$\frac{y(\omega)}{x(\omega)} = \frac{1 + z^{-1}}{1 + z^{-1} - 6z^{-2}} = \frac{1 + z^{-1}}{(1+3z^{-1})(1-2z^{-1})} = H(\omega)$

$z^{-1} = x$

$\Rightarrow \frac{1+x}{(1+3x)(1-2x)} = \frac{A}{1+3x} + \frac{B}{1-2x} \Rightarrow A = 2/5 \quad B = -3/5$

$(1-2x) \quad (1+3x)$

$H[n] = \frac{1}{5}(2(-3)^n + 3.2^n)$

$y(n) = x(n) * h(n)$

$\frac{1 + \frac{1}{z}}{(1 + \frac{3}{z})(1 - \frac{2}{z})} = \frac{z+1}{(z+3)(z-2)}$