2017 Yazokulu BLNT6NBS Dersnotu
http://www.bulentaltinbas.com.tr/Isaretler_ve_Sistemler_6NBAS_DersNotu.pdf

2017 Yazokulu Vize-Quiz-Final
http://www.bulentaltinbas.com.tr/Isaretler_ve_Sistemler_6NBAS_QVF_Sinav.pdf

2017 Yaz Okulu QUİZ1

Soru $y(n) = x(-2n)$ zamanla değişip değişmediğiniz ispatlayınız?

Çözüm

$x_1(n) = x(n-k)$

$$\left. \begin{array}{l} y_1(n) = T[x_1(n)] = x_1(-2n) = x(-2n-k) \\ y(n-k) = x(-2(n-k)) = x(-2n+2k) \end{array} \right\} \text{eşit olmadığı için zamanla değişir}$$

2017 Yaz Okulu QUİZ2
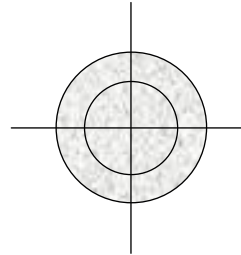
Soru DZD bir sistemin $H(z) = \dfrac{z^{-1}}{1 - \dfrac{1}{4} z^{-2}}$

    a) Sistemin kararlı olması için gerekli YB=? $|z| > \dfrac{1}{2}$

    b) Sitemin kararlı $h(n) = ?$
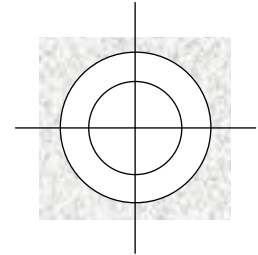
    c) Sistemin nedensel olup olmadığını gösteriniz

Çözüm

$$H(z) = \frac{z^{-1}}{1 - \dfrac{1}{4} z^{-2}}$$

$$= \frac{z^{-1}}{\left(1 - \dfrac{1}{2} z^{-1}\right)\left(1 + \dfrac{1}{2} z^{-1}\right)}$$

Nedensel değil
(Çemberin içi)

Nedensel
(Çemberin dışı)

$$H(z) = \frac{A}{\underbrace{\left(1 - \dfrac{1}{2} z^{-1}\right)}_{\substack{|z| > \frac{1}{2} \\ |z| < \frac{1}{2}}}} + \frac{B}{\underbrace{\left(1 + \dfrac{1}{2} z^{-1}\right)}_{\substack{|z| > \frac{1}{2} \\ |z| < \frac{1}{2}}}}$$

$$A = \left. \frac{z^{-1}}{1 + \dfrac{1}{2z^{-1}}} \right|_{z^{-1}=2} = 1$$

$$B = \left. \frac{z^{-1}}{1 - \dfrac{1}{2z^{-1}}} \right|_{z^{-1}=-2} = -1$$

$$H(z) = \frac{1}{\left(1 - \dfrac{1}{2} z^{-1}\right)} - \frac{1}{\left(1 + \dfrac{1}{2} z^{-1}\right)}$$
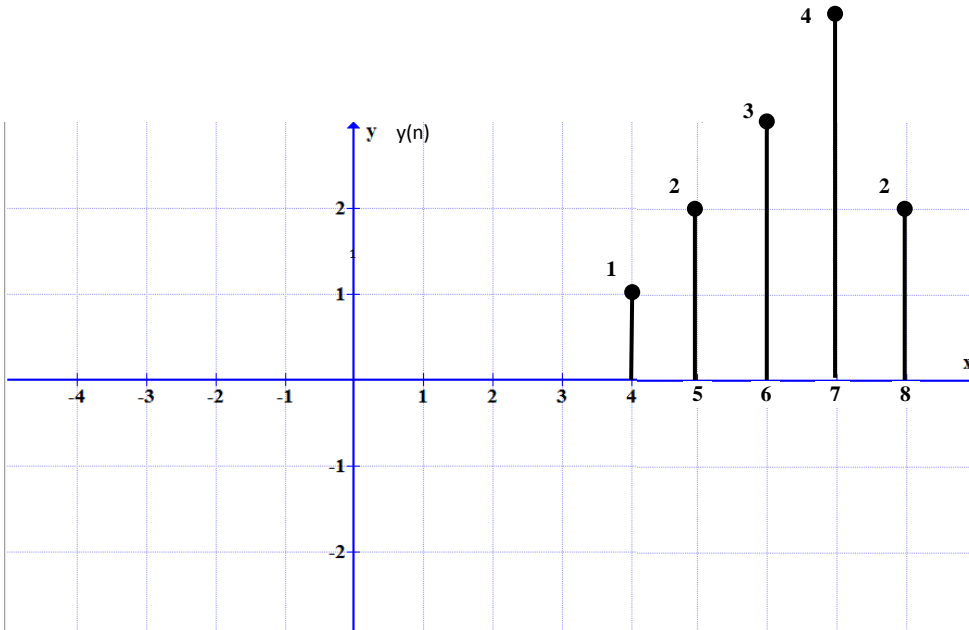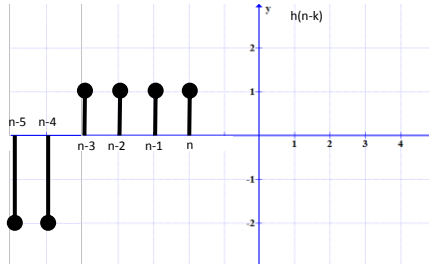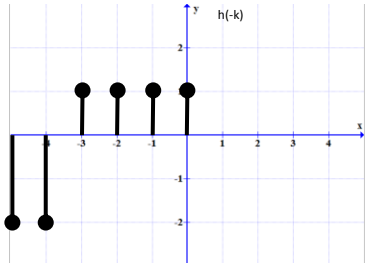
$$h(n) = \left(\frac{1}{2}\right)^n u(n) - \left(-\frac{1}{2}\right)^n u(n)$$

YB $|z| > \dfrac{1}{2}$

Çemberin dışı

Nedensel

2017 Yaz Okulu VİZE

Soru1 (30P) $h(n) = \begin{cases} 0 & n < 0 \\ 1 & 0 \le n \le 3 \\ -2 & 4 \le n \le 5 \\ 0 & n > 5 \end{cases}$ $x(n) = u(n-4)$ $y(n)$'i çiziniz?

Çözüm
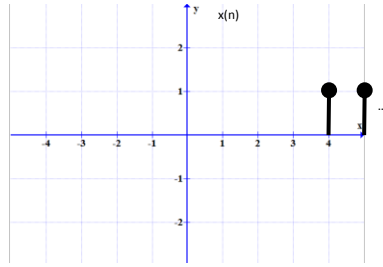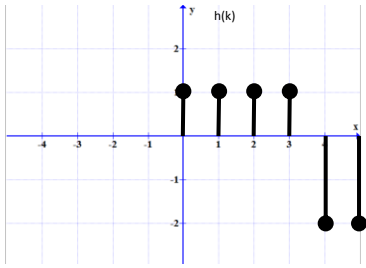
$n < 4$	$y(n) = 0$
$n = 4$	$y(4) = 1$
$n = 5$	$y(5) = 2$
$n = 6$	$y(6) = 3$
$n = 7$	$y(7) = 4$
$n = 8$	$y(8) = 2$
$n = 9$	$y(9) = 0$
$n > 9$	$y(n) = 0$

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Soru2 (35P) $y(n) - y(n-1) = x(n) + \frac{1}{2}x(n-1)$ $y(-1) = \frac{1}{2}$ $x(n) = (-1)^n u(n)$ $y_t(n) = ?$

Çözüm

$$y(n) = \lambda^n$$

$$y(n) - y(n-1) = x(n) + \frac{1}{2}x(n-1)$$

$y_d = c_1 \lambda^n$

$$\lambda^n - \lambda^{n-1} = 0$$

$y_d = \frac{1}{2}(1)^n$

$$\lambda^{n-1} \underbrace{(\lambda - 1)}_{0} = 0$$

$$\lambda = 1$$

$n = 0 \begin{cases} y(n) - y(n-1) = 0 \\ y(0) - y(-1) = 0 \\ y(0) - \frac{1}{2} = 0 \\ y(0) = \frac{1}{2} \\ c_1 = \frac{1}{2} \end{cases}$

$$y(n) - y(n-1) = x(n) + \frac{1}{2}x(n-1)$$

$x(n) = (-1)^n u(n)$

$$K(-1)u(n) - K(-1)^{n-1}u(n-1) = (-1)^n u(n) + \frac{1}{2}(-1)^{n-1}u(n-1)$$

$y_ö(n) = K(-1)^n u(n)$

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

$y_ö(n) = \frac{1}{4}(-1)^n u(n)$

$$-2K = -\frac{1}{2}$$

$$K = \frac{1}{4}$$

$y_z(n) = c_2(1)^n + y_ö(n)$

$y_z(n) = c_2(1)^n + \frac{1}{4}(-1)^n u(n)$

$n = 0 \begin{cases} y(n) - y(n-1) = x(n) + \frac{1}{2}x(n-1) \\ y(0) - y(\cancel{-1}) = x(0) + \frac{1}{2}x(\cancel{-1}) \\ \quad\quad\quad 0 \quad\quad\quad\quad 0 \\ y(0) = 1 \end{cases}$

$c_2(1)^n + \frac{1}{4}(-1)^n u(n)$

$c_2(1)^0 + \frac{1}{4}(-1)^0 u(0)$

$c_2 + \frac{1}{4} = y(0) = 1$

$c_2 = \frac{3}{4}$

$y_z(n) = \frac{3}{4}(1)^n + \frac{1}{4}(-1)^n u(n)$

$$y_t(n) = y_d(n) + y_ö(n)$$

$$= \frac{1}{2}(1)^n + \frac{3}{4}(1)^n + \frac{1}{4}(-1)^n u(n)$$

$$= \left(\frac{5}{4} + \frac{1}{4}(-1)^n\right) u(n)$$

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Soru3 (35P) $x(n) = \left(\dfrac{1}{2}\right)^n u(n)$ $x_1(n) = nx(-n+2)$ $X_1(z) = ?$ $YB = ?$

$$x(n) = \left(\dfrac{1}{2}\right)^n u(n)$$

$$X(z) = \dfrac{1}{1 - \dfrac{1}{2}z^{-1}} \qquad\qquad |z| > \dfrac{1}{2}$$

$$x_2(n) = x(n+2)$$

$$X_2(z) = z^2 \dfrac{1}{1 - \dfrac{1}{2}z^{-1}} \qquad\qquad |z| > \dfrac{1}{2}$$

$$x_3(n) = x_2(-n)$$
$$x_2(-n) = x(-n+2)$$

$$X_3(z) = X_2(z^{-1})$$

$$X_3(z) = \left(z^{-1}\right)^2 \dfrac{1}{1 - \dfrac{1}{2}\left(z^{-1}\right)^{-1}} \qquad\qquad |z| > \dfrac{1}{2}$$

$$X_3(z) = z^{-2} \dfrac{1}{1 - \dfrac{1}{2}z}$$

$$x_1(n) = nx_3(n)$$

$$X_1(z) = -z \dfrac{d}{dz} X_3(z)$$

$$= -z \dfrac{d}{dz} \dfrac{z^{-2}}{1 - \dfrac{1}{2}z}$$

$$= -z \dfrac{-2z^{-3}\left(1 - \dfrac{1}{2}z\right) + \dfrac{1}{2}z^{-2}}{\left(1 - \dfrac{1}{2}z\right)^2} \qquad\qquad |z| < 2$$

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