15.11.2016

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Sakarya Üniversitesi

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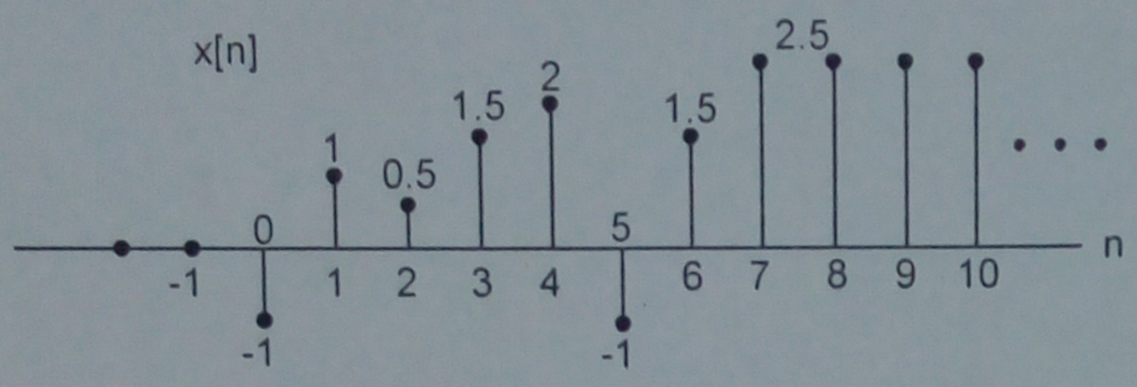
İşaretler ve Sistemler Vize Soruları

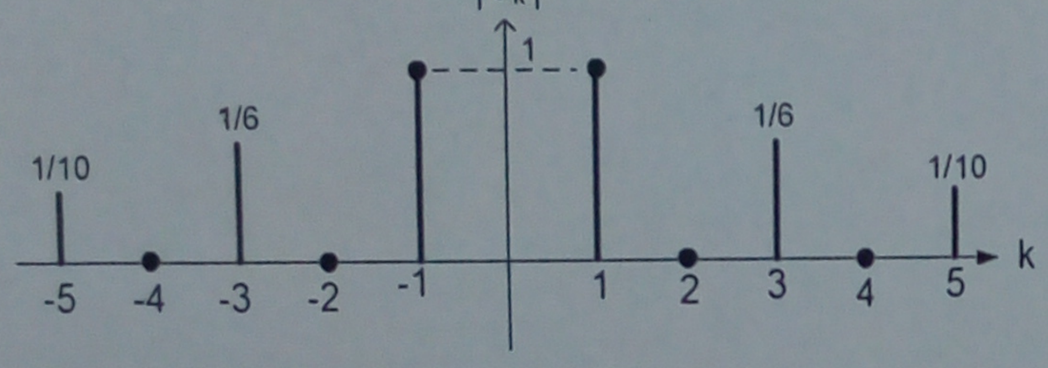
S.1)

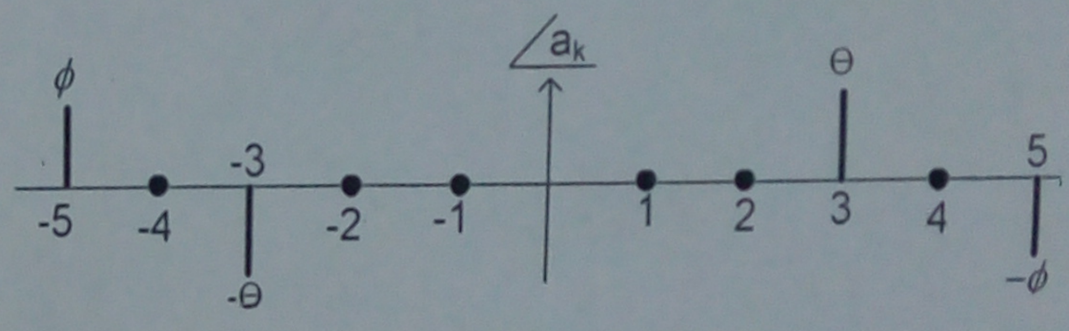


Yanda verilen $x[n]$ işaretini dikkate alarak

$x_1[n] = -\delta[n] + x[-3n-2]$ işaretini çizerek gösteriniz.

S.2) Genlik ve faz spektrumu aşağıda verilen $x(t)$ işaretinin trigonometrik ifadesini elde ediniz.



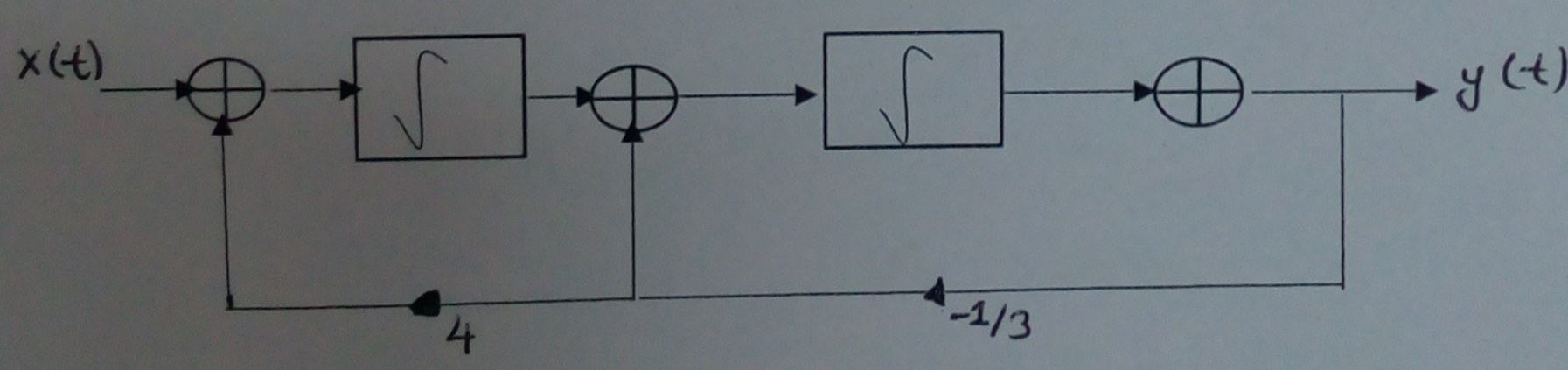


S.3) Sürekli zaman doğrusal ve zamanla değişmeyen bir sistemin girişi x(t) ve impuls cevabı h(t) verilmektedir. Sistemin girişini ve impuls cevabını çiziniz. Sistemin çıkışını bulunuz.

$$x(t) = \begin{cases} 1, & 0 \le t < 1 \\ 2-t, & 1 \le t < 2 \end{cases} \qquad h(t) = u(t+1) - u(t-2)$$

S.4) a) $y[n] - \frac{3}{4}y[n-1] + \frac{1}{6}y[n-2] = 2.x[n]$ şeklinde giriş çıkış ilişkisi verilen doğrusal ve zamanla değişmeyen sistemin blok diyagramını çiziniz. Sistemin nedensellik, karalılık ve hafızasızlık özelliklerini açıklayarak inceleyiniz.

b)



Blok diyagramı yukarıda verilen sürekli zaman doğrusal ve zamanla değişmeyen sistemin giriş çıkış ilişkisini yazınız. Sistemin nedensellik, karalılık ve hafızasızlık özelliklerini açıklayarak inceleyiniz.

$$x(t) = \sum_{k=-\infty}^{\infty} a_k e^{jk\omega_0 t} = \sum_{k=-\infty}^{\infty} a_k e^{jk(2\pi/T)t} \qquad a_k = \frac{1}{T}\int_T x(t)e^{-jk\omega_0 t}\,dt$$

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

Sınav süresi 75 dakikadır. Başarılar Dileriz.

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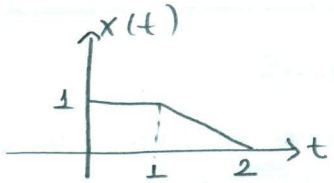
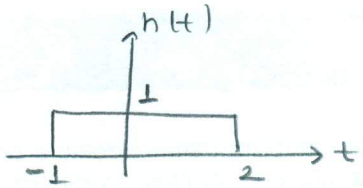
3)

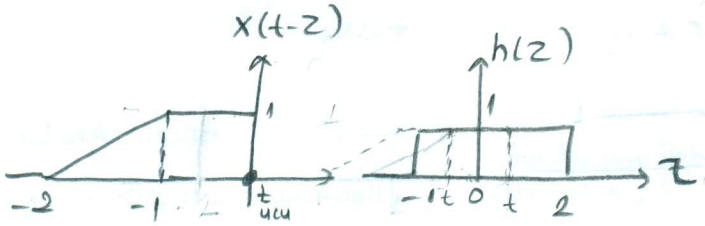




$$y(t) = \int_{-\infty}^{\infty} x(z)\cdot h(t-z)\,dz$$

veya

$$y(t) = \int_{-\infty}^{\infty} h(z)\,x(t-z)\,dz.$$



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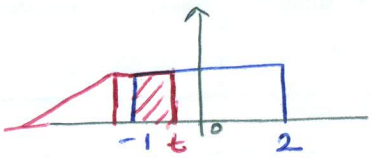
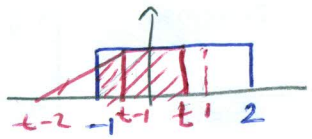
$y(t) = 0$, $t < -1$

$$y(t) = \int_{-1}^{t} h(z)\cdot x(t-z)\,dz = \int_{-1}^{t} 1\cdot 1\,dz = t+1 \quad , \quad -1 \le t < 0$$



$$y(t) = \int_{t-1}^{t} \underbrace{h(z)}_{1}\,\underbrace{x(t-z)}_{1}\,dz + \int_{-1}^{t-1} 1\cdot 2(t-z)\,dz \quad , \quad 0 \le t \le 1$$



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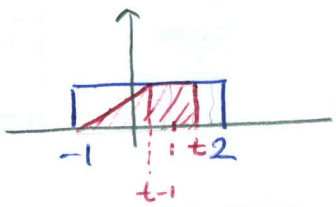
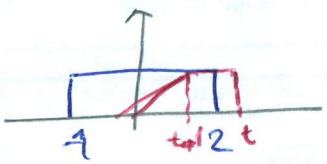
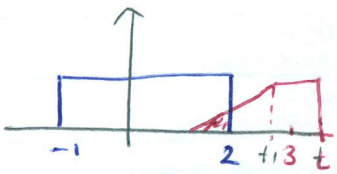
$$y(t) = \int_{t-1}^{t} 1\cdot 1\,dz + \int_{t-2}^{t-1} 1\cdot 2(t-z)\,dz \quad , \quad 1 \le t \le 2$$



$$y(t) = \int_{t-1}^{2} 1\,dz + \int_{t-2}^{t-1} 2\cdot(t-z)\,dz \quad , \quad 2 \le t \le 3$$



$$y(t) = \int_{t-2}^{2} 2\cdot(t-z)\,dz \quad , \quad 3 \le t \le 4$$



$y(t) = 0$, $t > 4$

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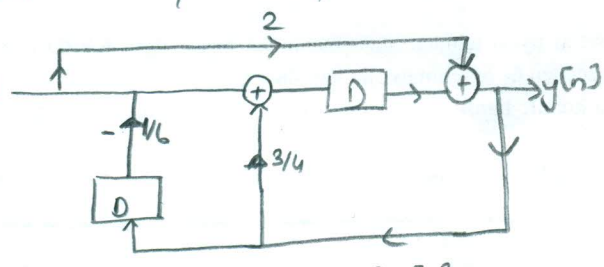
4) a)



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$$y[n] = \frac{3}{4}y[n-1] - \frac{1}{6}y[n-2] + 2x[n]$$

Sistem nedensel, kararlı, hafızalıdır.

b) $y(t) = \iint x(t)\,dt - \frac{4}{3}\iint y(t)\,dt - \frac{1}{3}\int y(t)\,dt$

$$\frac{d^2y(t)}{dt^2} + \frac{1}{3}\frac{dy(t)}{dt} + \frac{4}{3}y(t) = x(t)$$

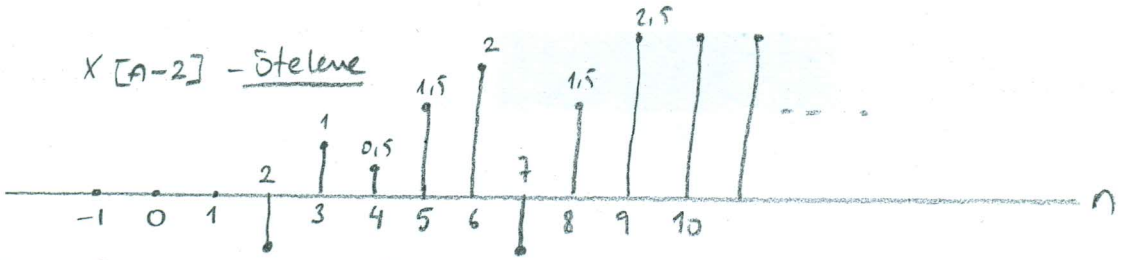
Nedensel, kararlı ve hafızalıdır.

Vize Çözüm 15.11.2016

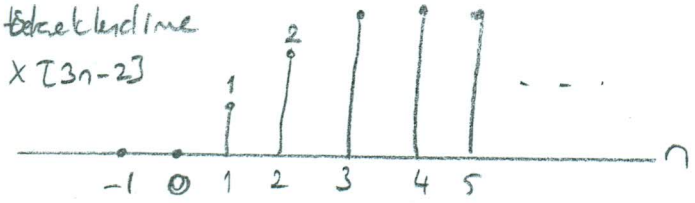
C.1 $x_1[n] = -\delta[n] + x[-3n-2]$

• Önce $x[-3n-2]$ yi elde edelim. (Öteleme, ölçeklendirme, ters

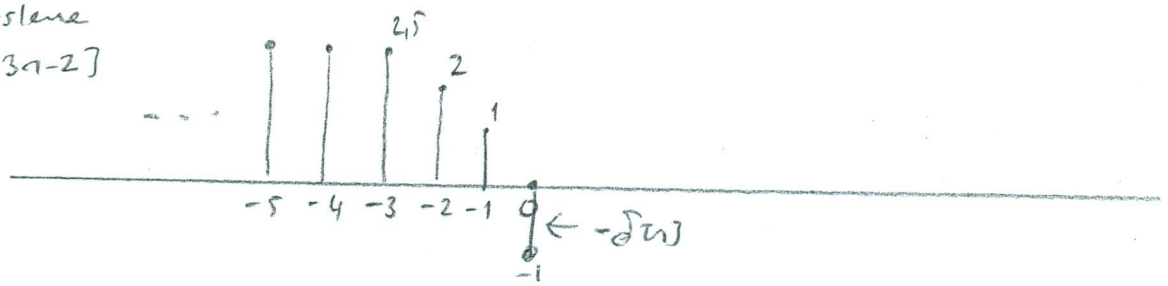
$x[n-2]$ - Öteleme



Ölçeklendirme
$x[3n-2]$



Terslene
$x[-3n-2]$



C.2 $x(t) = \sum_{k=-\infty}^{\infty} a_k e^{jk\omega_0 t}$, $|a_k|$ ve $\angle a_k$ grafiğinden faydalanarak;

$$x(t) = \underbrace{1.e^{j1\omega_0 t}}_{k=1} + \underbrace{1.e^{-j1\omega_0 t}}_{k=-1} + \underbrace{\frac{1}{6}e^{j\theta}e^{j3\omega_0 t}}_{k=3} + \underbrace{\frac{1}{6}e^{-j\theta}e^{-j3\omega_0 t}}_{k=-3} + \underbrace{\frac{1}{10}e^{-j\phi}e^{j5\omega_0 t}}_{k=5} + \underbrace{\frac{1}{10}e^{j\phi}e^{-j5\omega_0 t}}_{k=-5}$$

$$x(t) = 2\left(\frac{e^{j\omega_0 t} + e^{-j\omega_0 t}}{2}\right) + \frac{2}{6}\left(\frac{e^{j(3\omega_0 t+\theta)} + e^{-j(3\omega_0 t+\theta)}}{2}\right) + \frac{2}{10}\left(\frac{e^{j(5\omega_0 t-\phi)} + e^{-j(5\omega_0 t-\phi)}}{2}\right)$$

$$x(t) = 2\cos\omega_0 t + \frac{1}{3}\cos(3\omega_0 t + \theta) + \frac{1}{5}\cos(5\omega_0 t - \phi)$$