

1-) LTI bir sistemin giriş-çıkış arasındaki ilişki aşağıdaki fark denklemi ile tanımlanmaktadır. Buna göre frekans cevabı ($H(\omega)$) ve dürtü cevabı $h(t)$ yi bulun.

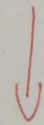
Denklemin Fourier'i alınırsa

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

$$(j\omega)^2 Y(\omega) + 4(j\omega) Y(\omega) + 3 Y(\omega) = (j\omega) X(\omega) + 2X(\omega)$$

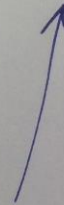
$$[(j\omega)^2 + 4(j\omega) + 3] Y(\omega) = (j\omega + 2) X(\omega)$$

$$H(\omega) = \frac{Y(\omega)}{X(\omega)} = \frac{(j\omega) + 2}{(j\omega)^2 + 4(j\omega) + 3}$$



Frekans cevabı

$$h(t) = \mathcal{F}^{-1} \{ H(\omega) \}$$



Parçalı kesirler toplamı şeklinde ifade edelim.

$$\frac{A}{(3+j\omega)} + \frac{B}{(1+j\omega)} = \frac{2+j\omega}{(3+j\omega)(1+j\omega)}$$

$$A = 1/2 \quad B = 1/2$$

$$H(\omega) = \frac{1/2}{3+j\omega} + \frac{1/2}{1+j\omega}$$

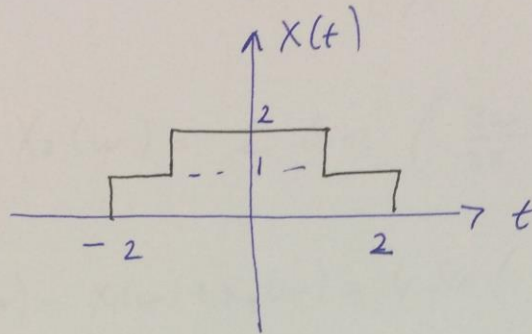
Tablo dan :

$$e^{-bt} u(t) \xrightarrow{\tilde{F}} \frac{1}{j\omega + b}$$

$$h(t) = \tilde{F}^{-1} \{ H(\omega) \} = \frac{1}{2} e^{-3t} u(t) + \frac{1}{2} e^{-t} u(t)$$

↓
Birim dürtü cevabı

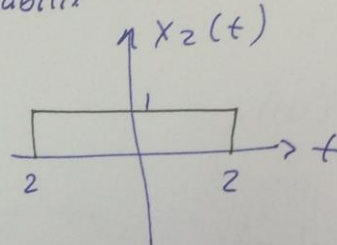
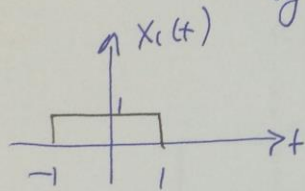
2.)



$$\mathcal{F}\{X(t)\} = ?$$

$X(t)$ sinyalinin
Fourier dönüşümünü
gerçekleyin.

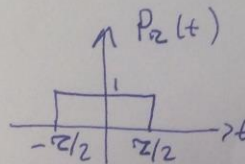
Verilen grafik
2 alt bileşenin toplamı şeklinde
ayrıştırılabilir



$X(t) = X_1(t) + X_2(t)$ gibi
Ayrı ayrı fourier alalım.

$$X(\omega) = \mathcal{F}\{X(t)\} = \mathcal{F}\{X_1(t)\} + \mathcal{F}\{X_2(t)\}$$

Hatırla:



$$\mathcal{F}$$

$$p_2(\omega) =$$

$$z \operatorname{sinc}\left(\frac{z\omega}{2\pi}\right)$$

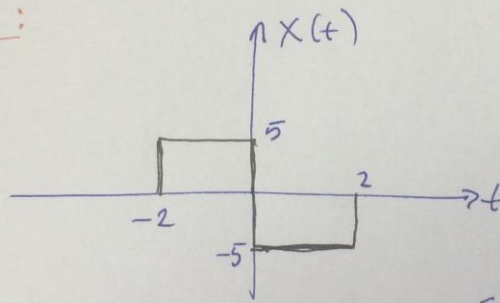
$$X_1(\omega) = 4 \operatorname{sinc}\left(\frac{4\omega}{2\pi}\right)$$

$$X_2(\omega) = 2 \operatorname{sinc}\left(\frac{2\omega}{2\pi}\right)$$

$$X(\omega) = X_1(\omega) + X_2(\omega) = 4 \operatorname{sinc}\left(\frac{2\omega}{\pi}\right) + 2 \operatorname{sinc}\left(\frac{\omega}{\pi}\right)$$

o lun.

Ödev :



$$x(\omega) = ?$$

Verilen $x(t)$

signalinin Fourier
dönüşümünü
gerçekleyin.