Fourier Serileri Özet

CT

$$a_k = \frac{1}{T}\int_T x(t)\, e^{-jkw_0 t}\, dt$$

$$x(t) = \sum_{k=-\infty}^{\infty} a_k \cdot e^{jkw_0 t}$$

DT

$$a_k = \frac{1}{T}\sum_{n=-\infty}^{\infty} x[n]\, e^{-jkw_0 n}$$

$$x[n] = \sum_{n=-\infty}^{\infty} a_k \cdot e^{jkw_0 n}$$

Özellikler

$$x(t \pm t_0) \xrightarrow{FS} a_k \cdot e^{\pm jkw_0 t_0}$$

$$x(-t) \xrightarrow{FS} a_{-k}$$ Fonk Çift ise $x(-t) = x(t)$, Fonk tek ise $x(-t) = -x(t)$

$$a\,x(t) \xrightarrow{FS} a_k$$

$$x(t) * y(t) \longrightarrow a_k \cdot b_k \cdot T$$

$$x(t) \longrightarrow a_k$$

$$w = \frac{2\pi}{T} \qquad \sin\theta = \frac{e^{j\theta} - e^{-j\theta}}{2j} \qquad \cos\theta = \frac{e^{j\theta} + e^{-j\theta}}{2} \qquad j^2 = -1$$

CT Fourier Transform Özet

$$\mathcal{F}[x(t)] = X(jw) = \int_{-\infty}^{\infty} x(t) . e^{-jwt} \, dt$$

$$x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(jw) . e^{jwt} \, dw$$

Özellikler

* $x(t \pm t_0) \xrightarrow{FT} X(jw) . x^{\pm jwt_0}$
* $x(-t) \longrightarrow X(-jw)$
* $e^{\mp jw_0 t} x(t) \longrightarrow X(j(w \mp w_0))$
* $x(a.t) \longrightarrow \frac{1}{|a|} X\left(\frac{jw}{a}\right)$

$e^{jw_0 t} \longrightarrow 2\pi\delta(w - w_0)$

* $\frac{d}{dt} x(t) \longrightarrow jw X(jw)$
* $t . x(t) \longrightarrow \frac{jd}{dw} X(jw)$
* $\delta(t) \longrightarrow 1$

$1 \longrightarrow 2\pi\delta(w)$

LTI

$$y(t) = h(t) * x(t) \xrightarrow{FT} Y(jw) = H(jw) . X(jw)$$

integral

$$\int e^{\pm ax+b} \, dx = \pm \frac{e^{ax+b}}{a}$$

$$e^{-at} u(t) = \frac{1}{a+jw}$$

DT Fourier Transform Özet

$$* \quad X(e^{jw}) = \sum_{-\infty}^{\infty} x[n] \cdot e^{-jwn}$$

$$x[n] = \frac{1}{2\pi} \int_{2\pi} X(e^{jw}) \cdot e^{jwn} \, dw$$

ÖZELLİKLER

$$x[n \pm n_0] \longrightarrow X(e^{jw}) \cdot e^{\pm jwn_0}$$

$$e^{\pm jw_0 n} \cdot x[n] \longrightarrow X(e^{j(w-w_0)})$$

$$x[-n] \longrightarrow X(e^{-jw})$$

$$n\,x[n] \longrightarrow \frac{jd}{dw} X(e^{jw})$$

$$e^{jw_0 n} \longrightarrow 2\pi \sum_{l=-\infty}^{\infty} \delta(w - w_0 - 2\pi l)$$

$$\delta[n] \longrightarrow 1$$

$$\boxed{\sum_{n=0}^{\infty} x^n = \frac{1}{1-x}}$$

$$a^n u[n] = \frac{1}{1-ae^{-jw}}$$

Z Transform Özet

$$X(z) = \sum_{n=-\infty}^{\infty} x[n] \cdot z^{-n}$$

Özellikler

$x[n \pm n_0] \longrightarrow X(z) \cdot e^{\pm n_0}$

$n \cdot x[n] \longrightarrow -z \frac{dx(z)}{dz}$

$x[-n] \longrightarrow x\left(\frac{1}{z}\right)$

$a^n u[n] \rightarrow \frac{1}{1-az^{-1}}$

Ters Z Dönüşümünde ROC $z >$ Değer Düz yani $x[n]$

$z <$ Değer ters yani $-x[-n-1]$