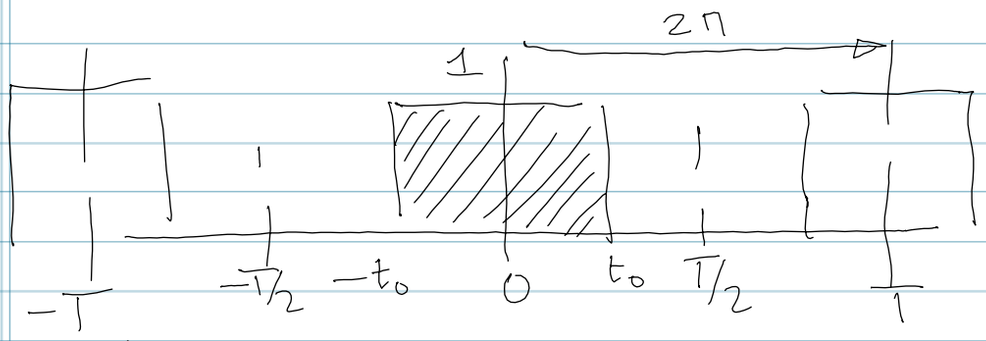
EG-247 Session 1 in Week 7.



Even function

$$c_k = \frac{1}{T}\int_{-t_0}^{t_0} e^{-j(k)\omega_0 t}\,dt$$

(k: harmonic No.; ω_0: fundamental frequency; T: period)

$-\infty \to k \to \infty$ k integer

$$\omega_0 = \frac{2\pi}{T}$$

$$T = \frac{2\pi}{\omega_0}$$

$$T = 1/f_0$$

f_0 in Hz

$$c_k = \frac{1}{T}\left(-\frac{1}{jk\omega_0}\right)\cdot\left[e^{-jk\omega_0 t}\right]_{-t_0}^{t_0}$$

$$= -\frac{1}{(j\omega_0 kT)}\left[e^{-jk\omega_0 t_0} - e^{jk\omega_0 t_0}\right]$$

$$\sin\Rightarrow \frac{e^{+j\omega t} - e^{-j\omega t}}{2j}$$

$$+\frac{1}{\omega_0 kT}\left(\frac{e^{jk\omega_0 t_0} - e^{-jk\omega_0 t_0}}{j2}\right)$$

$$\frac{2}{\omega_0 kT}\cdot \sin(k\omega_0 t_0)$$

$$\omega_0 = \frac{2\pi}{T}$$

$$C_k = \frac{2}{\frac{2\pi}{T} \cdot kT} \left[\sin k \frac{2\pi t_0}{T} \right]$$

$$= \frac{1}{\pi k} \left[\sin k \frac{2\pi}{T} t_0 \right]$$

$$\text{sinc}(x) = \frac{\sin \pi x}{\pi x}$$

$$= \frac{2t_0}{T} \text{sinc}\left(\pi k \frac{2t_0}{T} \right)$$

$$C_k = \eta \, \text{sinc}(k\eta)$$

when $\eta = \frac{2t_0}{T}$ = duty cycle.

ratio of "on" time to period.