Teoría de Comunicaciones y Señales

Participación 1.1

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ESCOM

Encuentre la STF

$$x(t) = \begin{cases} A(1-t) \\ \emptyset \\ -A(1-t) \end{cases} \qquad T = 4 \qquad w_0 = \frac{2\pi}{4} = \frac{\pi}{2}$$

$$a_n = \frac{2}{T}\int_{t_0}^{t_0+T} x(t)\cos(n w_0 t)\,dt$$

$$a_n = \frac{2}{4}\int_0^4 x(t)\cos(n w_0 t)\,dt \rightarrow \frac{4}{4}\int_0^2 x(t)\cos(n w_0 t)\,dt$$

$$= \int_0^2 x(t)\cos(n w_0 t)\,dt$$

$$= A\int_0^1 (1-t)\cos(n w_0 t)\,dt + \int_1^2 \emptyset\,dt = A\int_0^1 \cos(n w_0 t)\,dt - \int_0^1 t\cos(n w_0 t)\,dt$$

$u = t \quad dv = \cos(n w_0 t)$
$du = dt \quad v = \frac{1}{n w_0}\operatorname{sen}(n w_0 t)$

$$= \frac{A}{n w_0}\left[\operatorname{sen}(n w_0 t)\Big|_0^1 - \left(t\operatorname{sen}(n w_0 t) - \int_0^1 \operatorname{sen}(n w_0 t)\,dt\right)\right]$$

$$= \frac{A}{n w_0}\left[\operatorname{sen}(n w_0 t)\Big|_0^1 - \left(t\operatorname{sen}(n w_0 t) + \frac{2}{n\pi}\cos\left(\frac{n\pi}{2}t\right)\right)\Big|_0^1\right]$$

$$= \frac{2A}{n\pi}\left[\left(\operatorname{sen}\left(\frac{n\pi}{2}\right) - \operatorname{sen}(\emptyset)\right) - \left(\operatorname{sen}\left(\frac{n\pi}{2}\right) + \frac{2}{n\pi}\cos\left(\frac{n\pi}{2}\right) - \emptyset - \frac{2}{n\pi}\cos(0)\right)\right]$$

$$= \frac{2A}{n\pi}\left[\operatorname{sen}\left(\frac{n\pi}{2}\right) - \operatorname{sen}\left(\frac{n\pi}{2}\right) - \frac{2}{n\pi}\cos\left(\frac{n\pi}{2}\right) + \frac{2}{n\pi}\right] = \frac{4A}{(n\pi)^2}\left(-\cos\left(\frac{n\pi}{2}\right) + 1\right)$$

$$a_0 = \frac{2A}{4}\int_0^1 (1-t)\,dt = \frac{A}{2}\left[\left(t - \frac{1}{2}t^2\right)\Big|_0^1\right] = \frac{A}{2}\left[(1-0) - \frac{1}{2}(1-0)\right] = \frac{A}{2}\left(1 - \frac{1}{2}\right) = \frac{A}{4}$$

$$b_n = A\int_0^1 (1-t)\operatorname{sen}(n\omega_0 t)\,dt = A\left[\int_0^1 \operatorname{sen}(n\omega_0 t)\,dt - \int_0^1 t\operatorname{sen}(n\omega_0 t)\,dt\right]$$

$u = t \qquad dv = \operatorname{sen}(n\omega_0 t)$

$du = dt \qquad v = -\frac{1}{n\omega_0}\cos(n\omega_0 t)$

$$= \frac{-A}{n\omega_0}\left[-\cos(n\omega_0 t)\Big|_0^1 - \left[t\cos(n\omega_0 t) - \int_0^1 \cos(n\omega_0 t)\right]\right]$$

$$= \frac{-A}{n\omega_0}\left[\left(\cos\left(\frac{n\pi}{2}\right) - \cos(0)\right) - \left(\cos\left(\frac{n\pi}{2}t\right) - \operatorname{sen}\left(\frac{n\pi}{2}t\right)\frac{2}{n\pi}\right)\Big|_0^1\right]$$