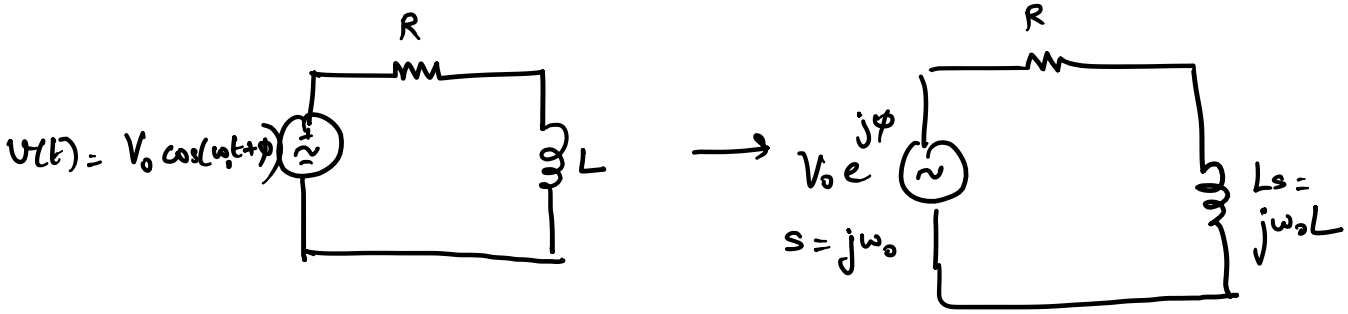
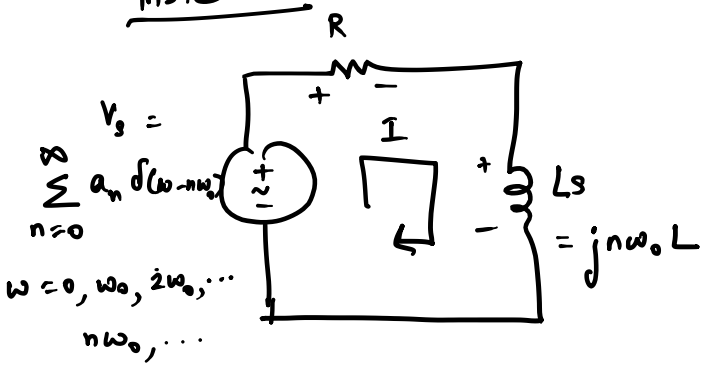
Lecture 7 / Chapter 18

Fourier Circuit Analysis

Review



Instead



$$+V_s - I_n \times R - I_n(jn\omega_0 L) = 0$$

$$I_n = \frac{V_s}{R + jn\omega_0 L} = \frac{a_n}{R + jn\omega_0 L}$$

$$I = \sum_{n=0}^{\infty} \frac{a_n}{R + jn\omega_0 L} \delta(\omega - n\omega_0)$$

Review

	Source	Frequency Domain	ckt
①	$v(t) = V_0$	$V(s) = V_0$ $s = 0$	$R \to R$ $L \to L_s \to$ short $C \to \frac{1}{Cs} \to$ open
②	$v(t) = V_0 \cos(\omega_0 t + \phi)$	$V(s) = V_0 \angle\phi$ $s = j\omega_0$	$R \to R$ $L \to j\omega_0 L$ $C \to \frac{1}{j\omega_0 C}$
③	$v(t) = V_0 e^{-\sigma t} \cos(\omega_0 t + \phi)$	$V(s) = V_0 \angle\phi$ $s = -\sigma + j\omega_0$	$R \to R$ $L \to sL$ $C \to \frac{1}{sC}$

④ $v(t) = V_0 e^{-\sigma t}$ $\quad V(s) = V_0$ $\quad s = -\sigma$

$R \to R$
$L \to Ls$
$C \to \frac{1}{sC}$

⑤ $v(t) = f(t)\,u(t)$ $\quad V(s)$ using $\mathcal{L}T$

$R \to R$
$L \to Ls$
$C \to \frac{1}{sC}$
} functions

⑥ $v(t)$ is periodic function with time period T, $\omega_0 = \frac{2\pi}{T}$ $\quad V(s)$ using Fourier Series

$R \to R$
$L \to jn\omega_0 L$
$C \to \frac{1}{jn\omega_0 C}$
} n is an integer from 0 to ∞

Steps

1. Find time period T & $\omega_0 = \frac{2\pi}{T}$ rad/s
2. Determine if function is odd or even

$f(-t) = f(t)$ (even function)

$f(-t) = -f(t)$ (odd function)