TABLE 6.1 Terminal Equations for Ideal Inductors and Capacitors

Inductors	
$v = L\frac{di}{dt}$	(V)
$i = \frac{1}{L}\int_{t_0}^{t} v\,d\tau + i(t_0)$	(A)
$p = vi = Li\frac{di}{dt}$	(W)
$w = \frac{1}{2}Li^2$	(J)
Capacitors	
$v = \frac{1}{C}\int_{t_0}^{t} i\,d\tau + v(t_0)$	(V)
$i = C\frac{dv}{dt}$	(A)
$p = vi = Cv\frac{dv}{dt}$	(W)
$w = \frac{1}{2}Cv^2$	(J)

TABLE 6.2 Equations for Series- and Parallel-Connected Inductors and Capacitors

Series-Connected

$$L_{eq} = L_1 + L_2 + \cdots + L_n$$

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_n}$$

Parallel-Connected

$$\frac{1}{L_{eq}} = \frac{1}{L_1} + \frac{1}{L_2} + \cdots + \frac{1}{L_n}$$

$$C_{eq} = C_1 + C_2 + \cdots + C_n$$

Parallel Inductors Initial Current

$$i(t_0) = i_1(t_0) + i_2(t_0) + i_3(t_0) + \cdots + i_n(t_0)$$

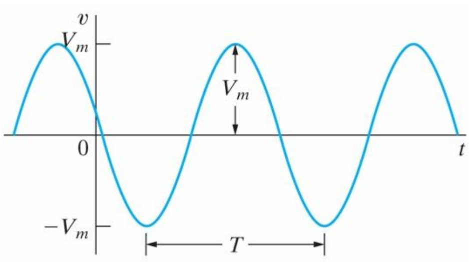
Series Capacitors Initial Voltage

$$v(t_0) = v_1(t_0) + v_2(t_0) + v_3(t_0) + \cdots + v_n(t_0)$$

Dot Convention Rule: When the reference direction of the **current enters** the dotted terminal of a coil, the reference polarity of the voltage induced in the other coil is **positive** at its dotted terminal OR

When the reference direction of the **current leaves** the dotted terminal of a coil, the reference polarity of the voltage induced in the other coil is **negative** at its dotted terminal

$$\boldsymbol{M = k\sqrt{L_1L_2}} \qquad \boldsymbol{w(t) = \frac{L_1i_1^2}{2} + \frac{L_2i_2^2}{2} \pm i_1i_2M} \qquad \boldsymbol{L = N^2\wp} \qquad \boldsymbol{\wp_1 = \wp_{11} + \wp_{21}}$$



$$v = V_m\cos(\omega t + \phi)$$

$$f = \frac{1}{T} = \frac{\omega}{2\pi}$$

$$\boldsymbol{V = ZI}$$

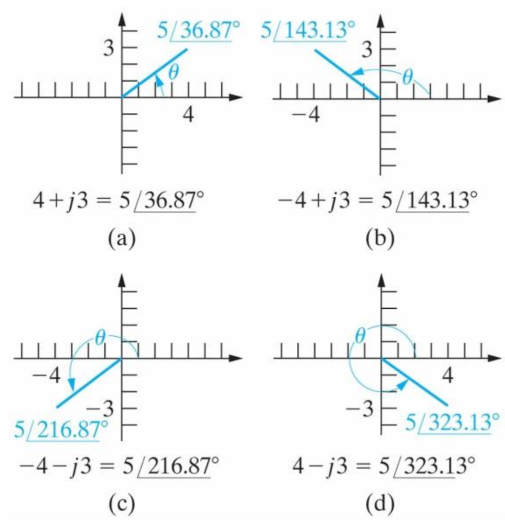


TABLE 9.1 Impedance and Reactance Values

Circuit Element	Impedance	Reactance
Resistor	R	—
Inductor	$j\omega L$	ωL
Capacitor	$j(-1/\omega C)$	$-1/\omega C$

Rectangular to Polar conversion

$$\boldsymbol{V} = A + jB = \sqrt{A^2 + B^2}\angle\left(\tan^{-1}\frac{B}{A}\right)°$$

Polar to Rectangular conversion

$\boldsymbol{V} = V_m\angle\phi° = V_m\cos\phi + jV_m\sin\phi$ (Note that V_m is a magnitude and should be positive, thus angle differs)

Complex Arithmetic

Addition/Subtraction – must be in rectangular coordinates; combine real terms and imaginary terms. Ex. $(A_1 + jB_1) + (A_2 + jB_2) = (A_1 + A_2) + j(B_1 + B_2)$

<u>Multiplication</u>

Rectangular coordinates; distribute (FOIL)

Polar coordinates; multiply the magnitudes and add the angles

<u>Division</u>

Polar coordinates; divide the magnitudes and subtract the angles

Rectangular coordinates; multiply the denominator and numerator by the complex conjugate of the denominator, then simplify

Complex Number Identities $j^2 = -1$ and $\frac{1}{j} = -j$