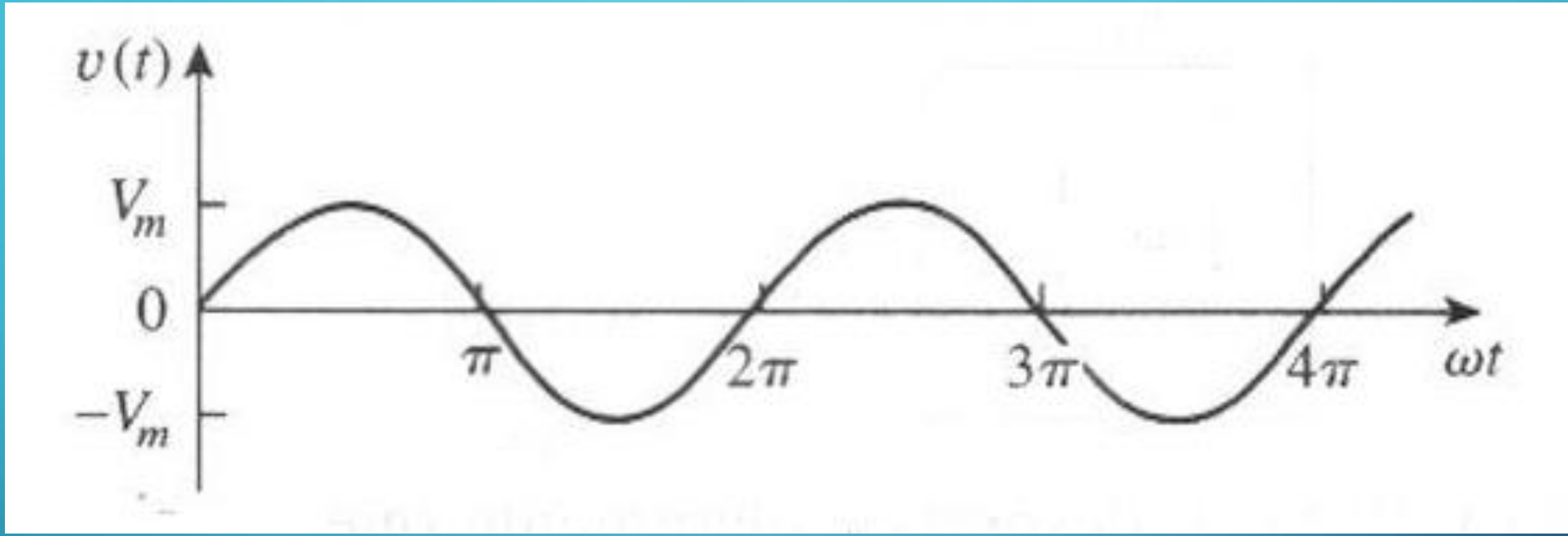
SENOIDES



$$v(t) = V_m \, sen\,(\omega t \pm \theta)$$

$$v(t) = V_m \, sen\,(\omega t)$$

V_m = Amplitud máxima

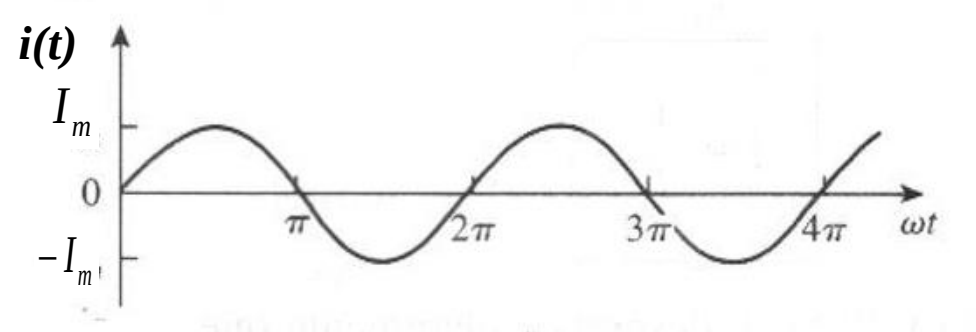
ω = Frecuencia angular Rad/s

ωt = Argumento

f = Frecuenci Hz T = Periodo s

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

SENOIDES



$$i(t) = I_m \, sen\,(\omega t)$$

Valor Promedio

$$I_{prom} = \frac{1}{T}\int_0^T i_{(t)} \cdot dt = \frac{1}{T}\int_0^T I_m sen(\omega t) \cdot dt = \frac{I_m}{T}\left[\int_0^T sen(\omega t) \cdot dt\right] = 0$$

Valor Eficaz

$$I_{ef} = \sqrt{\frac{1}{T}\int_0^T i^2{}_{(t)} \cdot dt} \neq 0 \Rightarrow \frac{I_m{}^2}{T}\sqrt{\int_0^T (sen^2 \omega t) \cdot dt} = \frac{I_m}{\sqrt{2}}$$

$$I_{ef} = \frac{I_m}{\sqrt{2}} = 0.707 \cdot I_m \Rightarrow I_{ef} \approx 70\%\, I_m$$

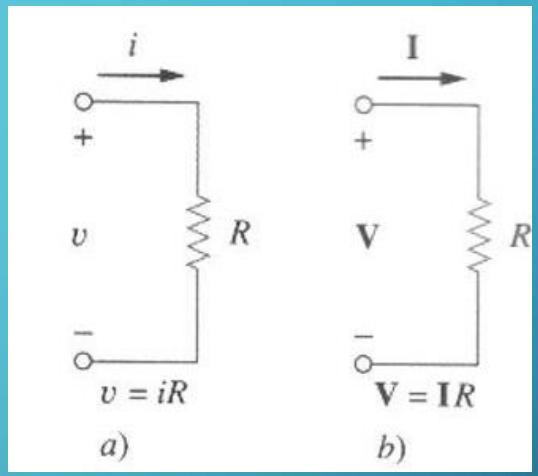
Relaciones Fasoriales entre los elementos de un circuito

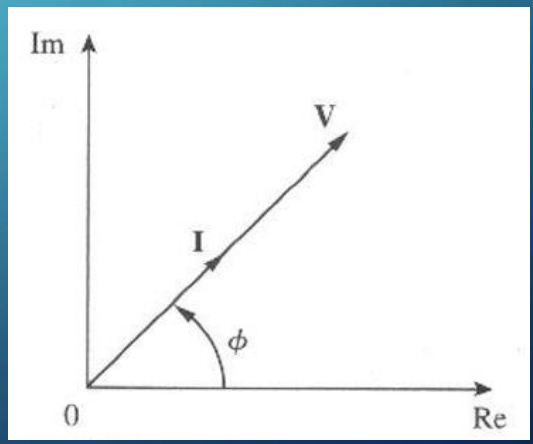
$$i(t) = I_m \ con \ (\omega t + \emptyset)$$

$$v = iR = RI_m \cos(\omega t + \phi)$$

$$\mathbf{V} = RI_m \angle \phi \qquad \mathbf{I} = I_m \angle \phi.$$

$$\mathbf{V} = R\mathbf{I}$$



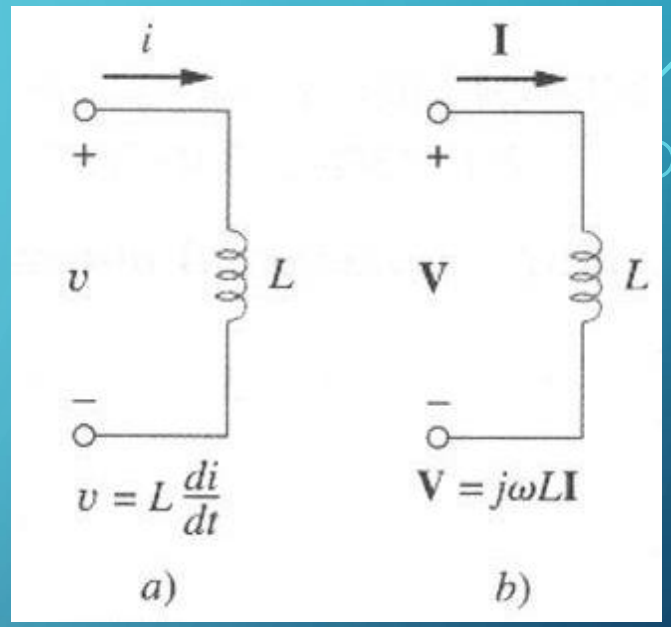


Relaciones Fasoriales entre los elementos de un circuito

$$i(t) = I_m \ con \ (\omega t + \emptyset)$$

$$v = L\frac{di}{dt} = -\omega L I_m \operatorname{sen}(\omega t + \phi)$$

$$-\operatorname{sen} A = \cos(A + 90°)$$



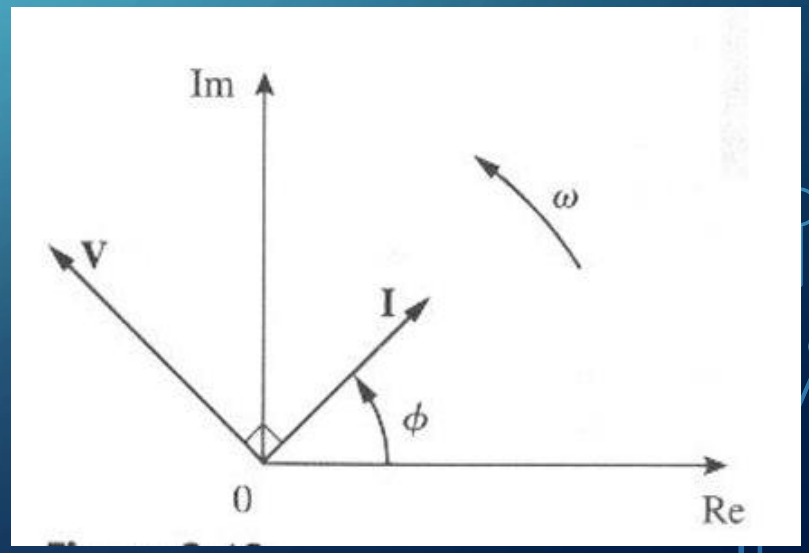
$$v = \omega L I_m \cos(\omega t + \phi + 90°)$$

$$\mathbf{V} = \omega L I_m e^{j(\phi+90°)} = \omega L I_m e^{j\phi} e^{j90°} = \omega L I_m \angle \phi + 90°$$

$$I_m \angle \phi = \mathbf{I}$$

$$e^{j90°} = j$$

$$\mathbf{V} = j\omega L \mathbf{I}$$



Relaciones Fasoriales entre los elementos de un circuito

$$v(t) = V_m \ con \ (\omega t \ + \emptyset \ )$$

$$i = C\frac{dv}{dt}$$

$$\frac{dv}{dt} \quad \Leftrightarrow \quad j\omega \mathbf{V}$$

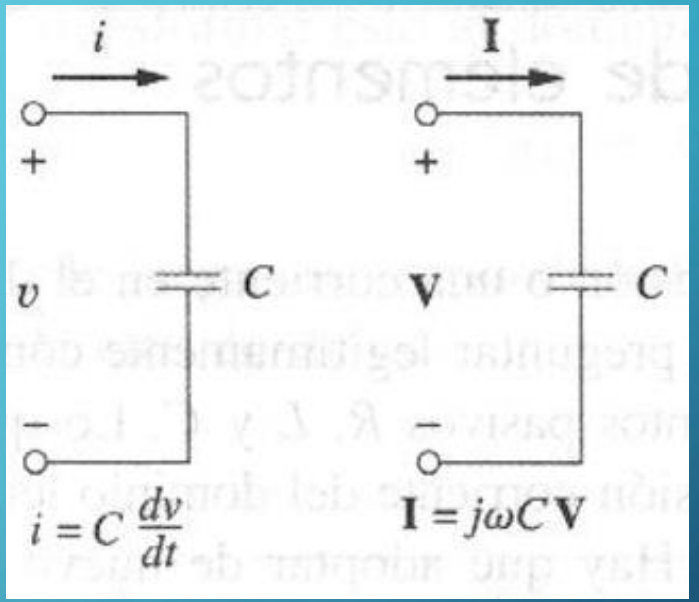
(Dominio temporal) (Dominio fasorial)

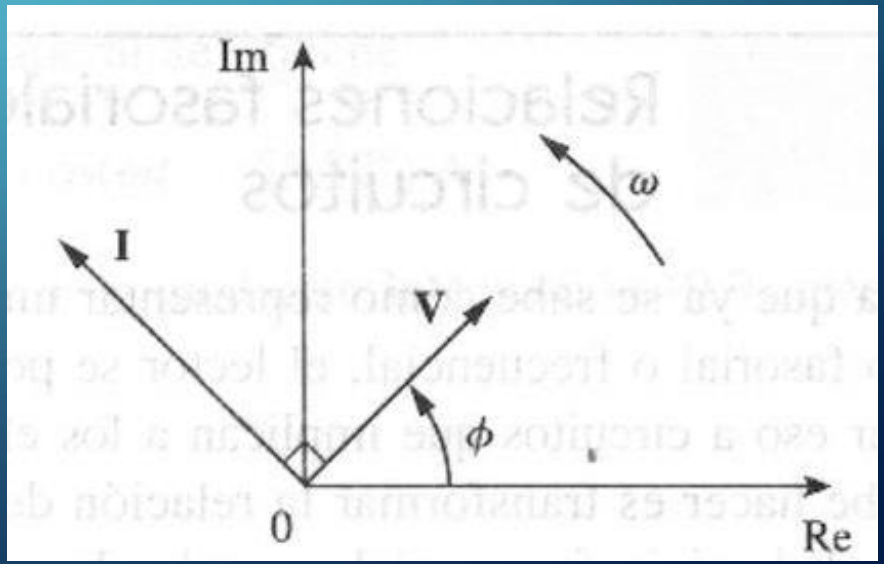
$$\int v\,dt \quad \Leftrightarrow \quad \frac{\mathbf{V}}{j\omega}$$

(Dominio temporal) (Dominio fasorial)

$$\mathbf{V} = \frac{\mathbf{I}}{j\omega C}$$

$$\mathbf{I} = j\omega C\mathbf{V}$$





Impedancia y Admitancia

$$\mathbf{V} = R\mathbf{I}, \qquad \mathbf{V} = j\omega L\mathbf{I}, \qquad \mathbf{V} = \frac{\mathbf{I}}{j\omega C}$$

$$\frac{\mathbf{V}}{\mathbf{I}} = R, \qquad \frac{\mathbf{V}}{\mathbf{I}} = j\omega L, \qquad \frac{\mathbf{V}}{\mathbf{I}} = \frac{1}{j\omega C}$$

$$\mathbf{Z} = \frac{\mathbf{V}}{\mathbf{I}} \quad \text{o sea} \quad \mathbf{V} = \mathbf{Z}\mathbf{I}$$

$$\mathbf{Z} = R \qquad \mathbf{Z} = j\omega L \qquad \mathbf{Z} = \frac{1}{j\omega C}$$

$$\mathbf{Y} = \frac{1}{R} \qquad \mathbf{Y} = \frac{1}{j\omega L} \qquad \mathbf{Y} = j\omega C$$

Impedancias en ohm

Admitancias siemens o mhos

Impedancia y Admitancia

$$\mathbf{Z} = R + jX$$

$$\mathbf{Z} = |\mathbf{Z}| \angle\theta$$

$$\mathbf{Z} = R + jX = |\mathbf{Z}| \angle\theta$$

$$|\mathbf{Z}| = \sqrt{R^2 + X^2}, \qquad \theta = \tan^{-1}\frac{X}{R}$$

$$R = |\mathbf{Z}| \cos\theta$$

$$X = |\mathbf{Z}| \operatorname{sen}\theta$$

$$\mathbf{Y} = \frac{1}{\mathbf{Z}} = \frac{\mathbf{I}}{\mathbf{V}}$$

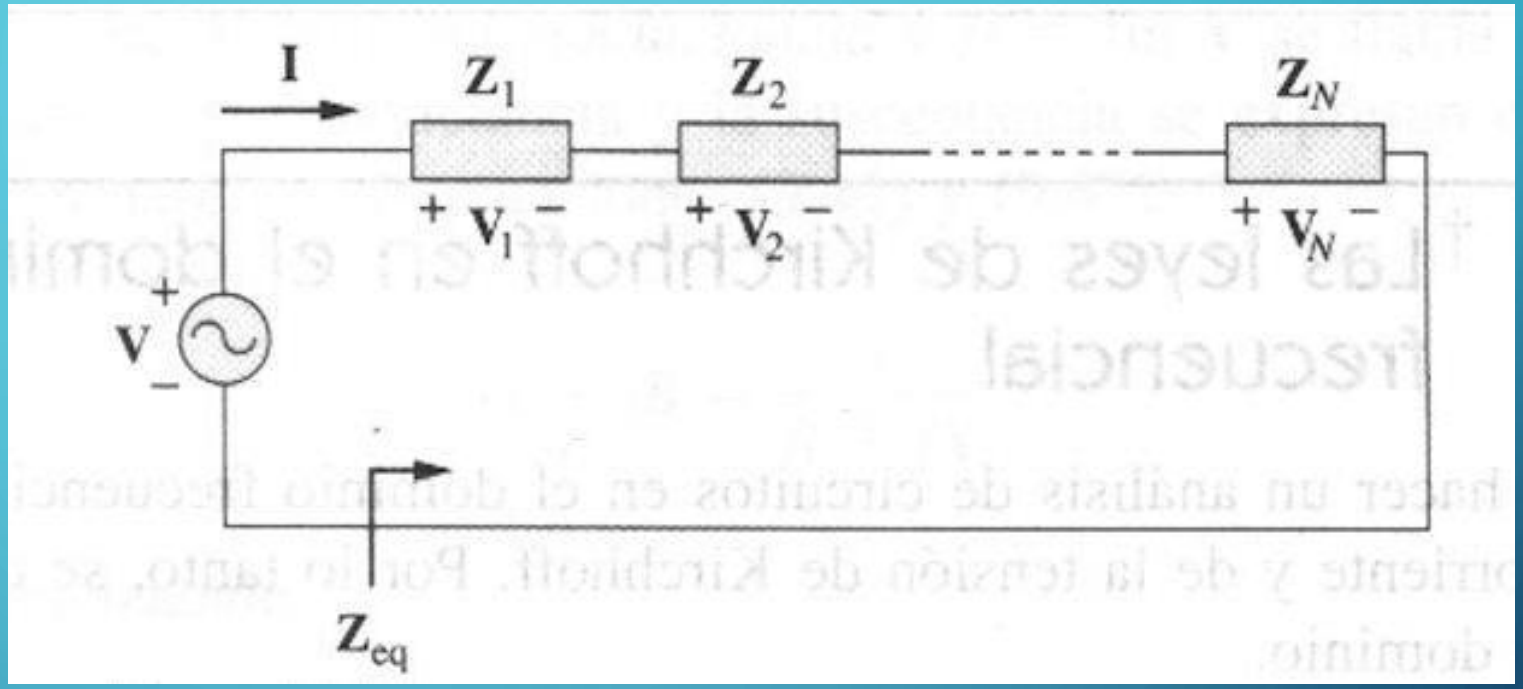
$$\mathbf{Y} = G + jB$$

$G = Parte\ real, Conductancia$

$B = Pasrte\ Imaginaria, Susceptancia$

Combinaciones de Impedancias y Admitancias

Combinaciones de Impedancias en ***serie.***



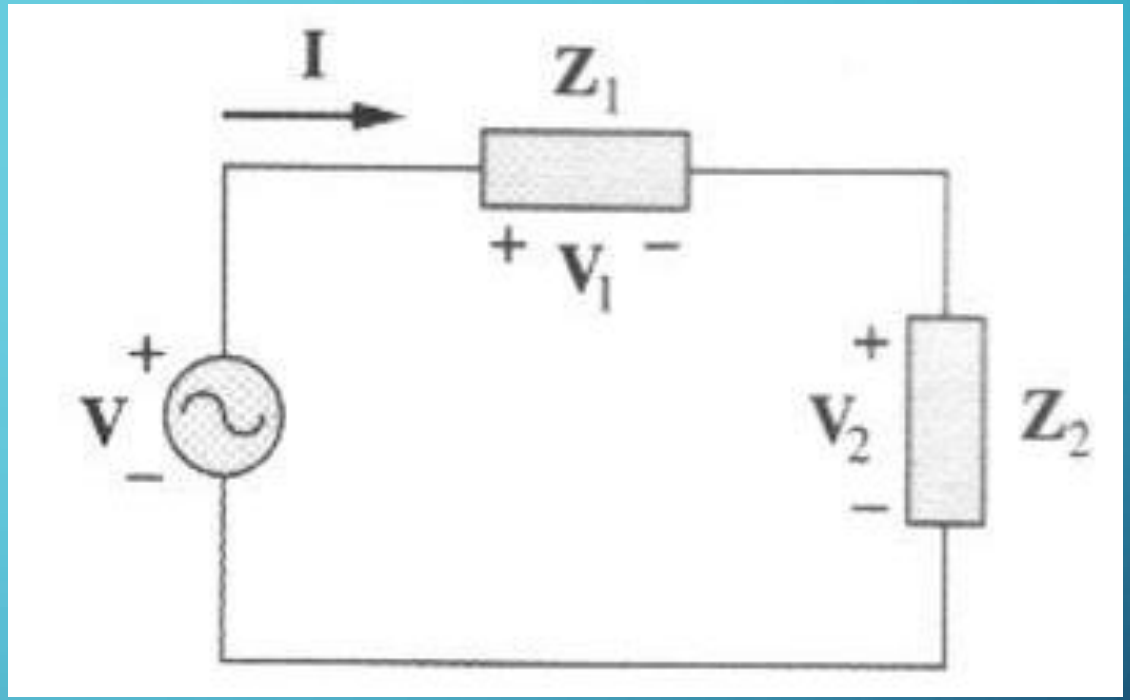
LTK

$$\mathbf{V} = \mathbf{V}_1 + \mathbf{V}_2 + \cdots + \mathbf{V}_N = \mathbf{I}(\mathbf{Z}_1 + \mathbf{Z}_2 + \cdots + \mathbf{Z}_N)$$

$$\mathbf{Z}_{eq} = \frac{\mathbf{V}}{\mathbf{I}} = \mathbf{Z}_1 + \mathbf{Z}_2 + \cdots + \mathbf{Z}_N$$

$$\mathbf{Z}_{eq} = \mathbf{Z}_1 + \mathbf{Z}_2 + \cdots + \mathbf{Z}_N$$

Dos impedancias conectadas en serie



$$I = \frac{V}{Z_1 + Z_2}$$

Divisor de tensión

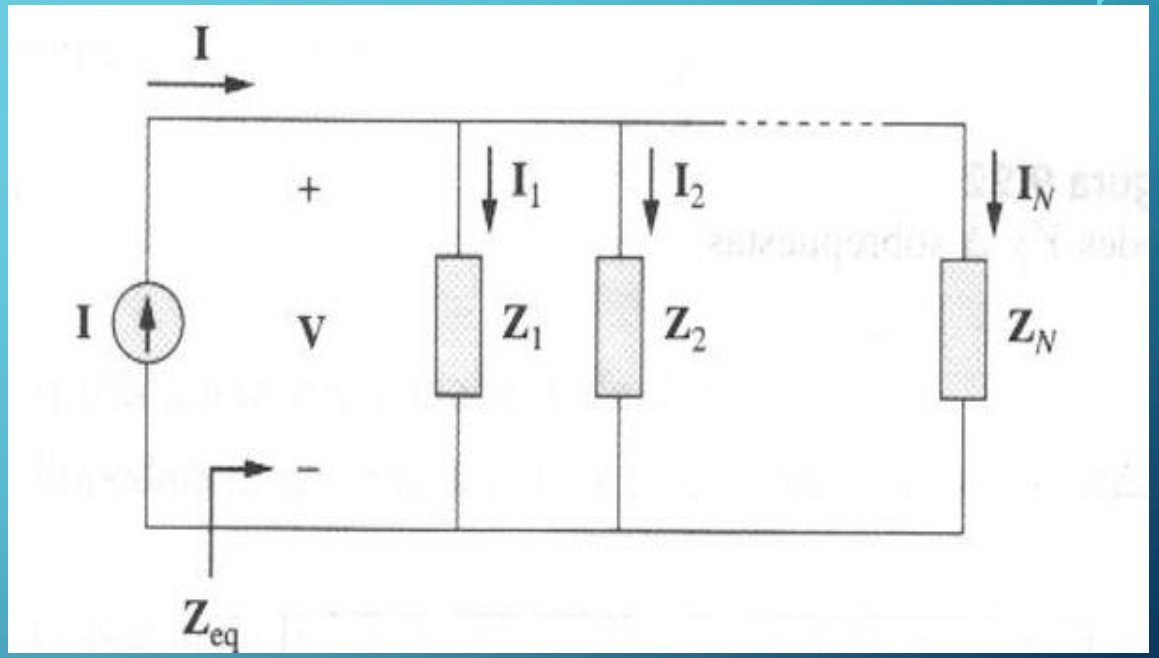
$$V_1 = \frac{Z_1}{Z_1 + Z_2} V,$$

$$V_2 = \frac{Z_2}{Z_1 + Z_2} V$$

Combinaciones de Impedancias y Admitancias

Impedancias en paralelo

$$\mathbf{I} = \mathbf{I}_1 + \mathbf{I}_2 + \cdots + \mathbf{I}_N = \mathbf{V}\left(\frac{1}{\mathbf{Z}_1} + \frac{1}{\mathbf{Z}_2} + \cdots + \frac{1}{\mathbf{Z}_N}\right)$$



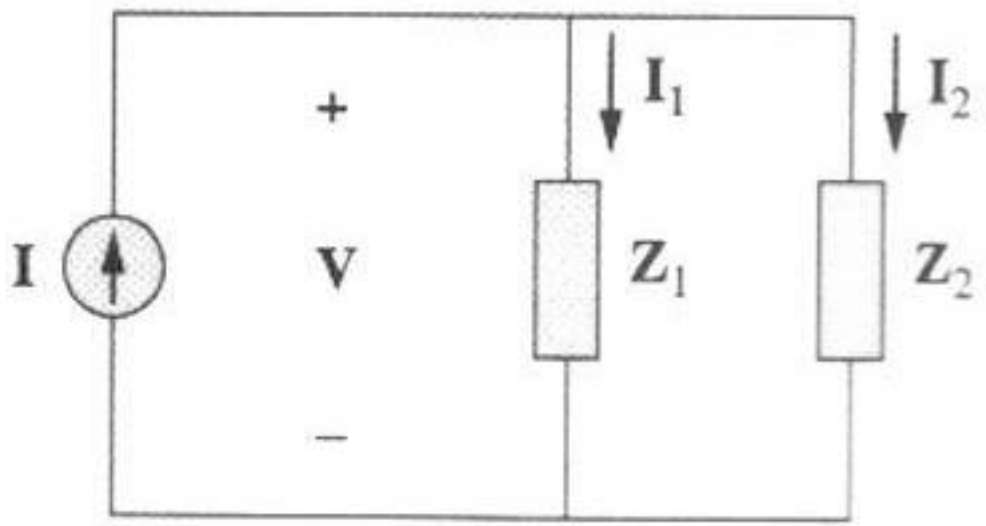
Impedancia equivalente

$$\frac{1}{\mathbf{Z}_{eq}} = \frac{\mathbf{I}}{\mathbf{V}} = \frac{1}{\mathbf{Z}_1} + \frac{1}{\mathbf{Z}_2} + \cdots + \frac{1}{\mathbf{Z}_N}$$

Admitancia equivalente

$$\mathbf{Y}_{eq} = \mathbf{Y}_1 + \mathbf{Y}_2 + \cdots + \mathbf{Y}_N$$

Combinaciones de Impedancias en **Paralelo**



$$Z_{eq} = \frac{1}{Y_{eq}} = \frac{1}{Y_1 + Y_2} = \frac{1}{1/Z_1 + 1/Z_2} = \frac{Z_1 Z_2}{Z_1 + Z_2}$$

$$V = IZ_{eq} = I_1 Z_1 = I_2 Z_2$$

Divisor de corriente

$$I_2 = \frac{Z_1}{Z_1 + Z_2} I$$

$$I_1 = \frac{Z_2}{Z_1 + Z_2} I,$$