Corrent Continua

General

$E = \Delta V \cdot d$ $\quad E = \overbrace{F \cdot d}^{W} \cdot q$ $\quad I = \frac{\Delta q}{t}$ $\quad \Delta W = -E$ $\quad P = I \cdot V$

$E = q \cdot \Delta V$ $\quad R = \frac{\rho \cdot L}{\pi \left(\frac{d}{2}\right)^2}$ $\quad W = F \cdot d$ $\quad V = I \cdot R$

$E = P \cdot t$

$\sigma = \frac{1}{\rho}$

Thevenin

$R_C\,Max = R_{TH}$ $\quad P_{trans}\,Max = \frac{\mathcal{E}_{TH}^2}{4R_{TH}}$ $\quad P_{diss} = \frac{(\mathcal{E}_{TH})^2}{(R_{TH} + R_C)^2} \cdot R_C$

Condensadors (CC)

$C = \frac{Area}{dist} \cdot \varepsilon_0 \cdot \varepsilon_r$ $\quad \varepsilon_r(Aire) \simeq 1$, $\varepsilon_0 = 8'85 \times 10^{-12}$ $\quad Q_{transf} = I \cdot t$

$Q = C \cdot \Delta V = C \cdot (E \cdot d)$

$E_{transf} = Q \cdot V$ $\quad E_{emm} = \frac{1}{2} \cdot \frac{Q^2}{C} = \frac{1}{2} \cdot Q \cdot V = \frac{1}{2} \cdot C \cdot V^2$

Corrent Alterna

Condensadors (CA)

$\tau_C = RC$ $\quad q(t) = \mathcal{E}C\left(1 - e^{\frac{-t}{\tau_C}}\right)$ $\quad q(t) = Q_0\, e^{\frac{-t}{\tau_C}}$

$I_0 = \frac{Q_0}{RC}$ $\quad I(t) = \frac{\mathcal{E}}{R}\left(1 - e^{\frac{-t}{\tau_C}}\right)$ $\quad I(t) = \frac{Q_0}{RC}\, e^{\frac{-t}{\tau_C}}$

$V(t) = \frac{Q_0}{C}\, e^{\frac{-t}{\tau_C}}$

Bobines

$\tau_L = \frac{L}{R}$ $\quad I(t) = \frac{\mathcal{E}}{R}\left(1 - e^{\frac{-t}{\tau_L}}\right)$ $\quad I(t) = I_0\, e^{\frac{-t}{\tau_L}}$

$E = \frac{1}{2} \cdot L \cdot I^2$

General

$V(t) = V_0 \cos(\omega t + \theta)$ $\quad I_0 = \frac{V_0}{|Z|}$ $\quad > 0$ I des V Desf. $\quad tg(\varphi) = \frac{X_{eq}}{R_{eq}}$

$I(t) = I_0 \cos(\omega t + \alpha)$ $\quad \alpha = \theta - \varphi$ $\quad < 0$ I des V Avan. $\quad \varphi = arctg\left(\frac{X}{R}\right)$

Altres

$I_{ef} = \frac{I_0}{\sqrt{2}}$ $\quad \omega = 2\pi f$ $\quad \overline{V_{TH}} = \overline{I} \cdot \overline{Z_{AB}}$ $\quad V_R = \overline{I_{(t)}} \cdot R$

$V_{ef} = \frac{V_0}{\sqrt{2}}$ $\quad f = \frac{1}{T}$ $\quad \overline{V_L} = \overline{I_{(t)}} \cdot \overline{Z_L}$

Resonància

$$f_0 = \frac{1}{2\pi} \cdot \frac{1}{\sqrt{LC}} \qquad \omega_0 = \frac{1}{\sqrt{LC}} \qquad f_n = n f_0$$

Filtres

$$\tau = \frac{V_{out}}{V_{in}} = \frac{R}{|Z|} = \frac{X_L}{|Z|} = \frac{X_C}{|Z|} \qquad I_0 = \frac{V_{in}}{|L\omega - \frac{1}{\omega C}|} \qquad V_{out} = I_0 \cdot X_L = I_0 \cdot R$$

Ample de Banda

$$V_{el} = \frac{1}{2\tau} = \frac{BW}{2} \qquad BW = \frac{1}{\tau} = 2V_{el} \qquad \tau = \frac{1}{f_b} \qquad \tau = \text{Duració pols.}$$

Potència

$$P(t) = V(t) \cdot I(t) \; [\text{Insta}] \qquad FP = \cos(\varphi) = \frac{R_{eq}}{|Z_{eq}|}$$

$$P = \frac{1}{2} \cdot I_0^2 \cdot R \; [\text{Diss Mitj}] \qquad \rightarrow X_L = X_C$$

$$P = I_{ef}^2 \cdot R \; [\text{Diss } R] \qquad \rightarrow X' = \frac{-(Z_{tot})^2}{X \text{ de } Z} = \frac{-(\sqrt{R^2 + X_L})^2}{X_L}$$

$$P = I_{ef} \cdot V_{ef} \cdot \cos(\varphi) = \frac{1}{2} V_0 I_0 \cos(\varphi)$$

$$S = \frac{1}{2} V_0 I_0 = I_{ef} V_{ef} \; [\text{Aparent}] \; (V \cdot A)$$

$$\bar{S} = \underbrace{I_{ef} V_{ef} \cos(\varphi)}_{\text{Activa}} + \underbrace{I_{ef} V_{ef} \sin(\varphi)}_{\text{Reactiva}} \; [\text{Complexa}] \; (VAR)$$

Harmònics

$$B_n = \frac{2V_0}{\pi n} \sin\left(\frac{n\pi}{2}\right) \qquad V(t) = -2 \text{ a } 2 \rightarrow V(t) + 2 = 0V \text{ a } 4V \rightarrow V_0 = 4V$$

$n = 1, 5, 9, 13 \ldots$ negatius

$n = 3, 7, 11, 15 \ldots$ positius