FORMULARIO

código: 261

Llei d'Ohm

Impedància

fasor intensitat $\bar{I} = I_0 \angle -\varphi$

$$V_{ef} = \frac{1}{\sqrt{2}} V_0$$

$$V_{ef} = Z_{ef} \cdot I_{ef}.$$

$$P = R_{ef} \cdot I_{ef}^2 = R_{ef} \cdot \left(\frac{V_{ef}}{Z_{ef}}\right)^2 \Rightarrow V_{ef} = \sqrt{\frac{P \cdot Z_{ef}^2}{R_{ef}}}$$

$$P = V_{ef} \cdot I_{ef} \cdot \cos\varphi$$

$$P = Z \cdot I_{ef} \cdot \cos\varphi$$

$$P = \frac{V_{ef}^2}{R}$$

$$S^2 = P^2 + Q^2$$

$$f_b = \frac{1}{T}$$

$$f_b = 2V$$

$$\cos(x) = sen\left(x + \pi/2\right)$$

$$sen(x) = \cos\left(x - \pi/2\right)$$

$$-sen(x) = sen\left(x + \pi\right)$$

$$sen(x) = \cos\left(x - \pi/2\right)$$

$$\cos(\varphi + \pi/2) = sen\left(\varphi + \pi\right)$$

$$\cos(\alpha) = sen\left(\alpha + \pi/2\right)$$

Nombres complexos

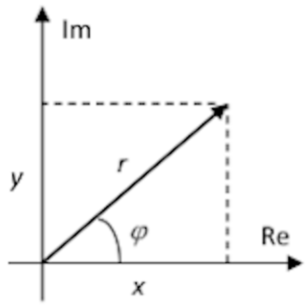
suma disjunta nombres reals i imaginaris purs. part real i una d'imaginària,

pla complex l'eix real i imaginària unitat imaginària $\boldsymbol{i} = \sqrt{-\mathbf{1}}$

complex conjugat $\bar{z_2}^* = x_2 - iy_2 = r_2\angle{-\varphi_2}$)

$$\bar{z_1} = x_1 + iy_1 = r_1\angle\varphi_1$$

$$\bar{z_2} = x_2 + iy_2 = r_2\angle\varphi_2$$



- Notació cartesiana $\bar{z} = x + iy$

$$x = r\cos\varphi \qquad y = r\sin\varphi$$

- Notació polar $\bar{z} = r_\varphi \quad o \quad r\angle\varphi$

$$r = \sqrt{x^2 + y^2} \qquad \varphi = \tan^{-1}\left(\frac{y}{x}\right)$$

- fórmula d'Euler

$$e^{i\varphi} = \cos\varphi + i\ \sin\varphi$$

$$\bar{z} = x + iy = r(\cos\varphi + i\ \sin\varphi) = re^{i\varphi} = r\angle\varphi$$

Euler

Exemples:

- $4 + 3i$

  $r = \sqrt{4^2 + 3^2} = 5$

  $\varphi = \tan^{-1}\left(\frac{3}{4}\right) = 36.9^o$

- $5 - 12i$

  $\sqrt{5^2 + 12^2} = 13$

  $\varphi = \tan^{-1}\left(\frac{-12}{5}\right) = -67.4^o = 292.6^o$

- $6\angle 120^o$

  $6\cos 120^o + i\sin 120^o = -3 + 5.2i$

Exemples: $(1+2i)\cdot(3-2i)=(3+4)+i(6-2)=7+4i$

$$2\angle 150^o \cdot 1\angle 30^o = 2\angle 180^o$$

$$(3-2i)\cdot(2+3i)=(6+6)+i(9-4)=12+5i$$

$$\begin{aligned}(3-2i)\cdot(2+3i) &= \sqrt{13}\angle -33.7^o \cdot \sqrt{13}\angle 56.3^o = 13\angle 22.6^o \\ &= 13\cos 22.6^o + i13\sin 22.6^o = 12+5i\end{aligned}$$

Exemples:

$$\frac{(2+i)}{(1-2i)} = \frac{(2+i)}{(1-2i)}\frac{(1+2i)}{(1+2i)} = \frac{(2-2)+i(4+1)}{(1+4)} = \frac{5i}{5} = i$$

$$4\angle 65^{o}/2\angle 15^{o} = 2\angle 50^{o}$$

$$\frac{(18-i)}{(3+4i)} = \frac{(18-i)}{(3+4i)}\frac{(3-4i)}{(3-4i)} = \frac{(54-4)+i(-72-3)}{(9+16)} = \frac{50-75i}{25} = 2-3i$$

Exemples: $(2+3i)+(4-i)=6+2i$

$$(3+3i)-(6+2i)=-3+i$$

- **Suma i resta** cartesiana:

$$\overline{z_1} + \overline{z_2} = (x_1 + x_2) + \ i(y_1 + iy_2)$$

$$\overline{z_1} - \overline{z_2} = (x_1 - x_2) + \ i(y_1 - iy_2)$$

- **Multiplicació**

cartesiana:

$$\overline{z_1} \cdot \overline{z_2} = (x_1 + iy_1) \cdot (x_2 + iy_2) = (x_1x_2 - y_1y_2) + i(x_1y_2 + x_2y_1)$$

polar

$$\overline{z_1} \cdot \overline{z_2} = r_1\angle\varphi_1 \cdot r_2\angle\varphi_2 = r_1r_2\angle(\varphi_1 + \varphi_2)$$

- **Divisió**

cartesiana:

$$\frac{\overline{z_1}}{\overline{z_2}} = \frac{x_1 + iy_1}{x_2 + iy_2} = \frac{(x_1 + iy_1)}{(x_2 + iy_2)}\frac{(x_2 - iy_2)}{(x_2 - iy_2)} =$$

$$= \frac{(x_1x_2 + y_1y_2) + i(x_2y_1 - x_1y_2)}{{x_2}^2 + {y_2}^2}$$

polar

$$\overline{z_1}/\overline{z_2} = r_1\angle\varphi_1/r_2\angle\varphi_2 = r_1/r_2\angle(\varphi_1 - \varphi_2)$$

$$\frac{(18-i)}{(3+4i)} = \frac{\sqrt{325}\angle -3.2^o}{5\angle 53.1^o} = 3.6\angle -56.3^o =$$

$$= 3.6\cos -56.3^o + i3.6\sin -56.3^o = \ 2-3i$$

Función Periódica Alterna Compleja

$$\bar{z}(t) = A\ \cos(\omega t + \theta) + iA\ \sin(\omega t + \theta)$$

$$= x(t) + \ iy(t)$$

$$x(t) = \ A\ \cos(\omega t + \theta)$$

$$iy(t)\ = iA\ \sin(\omega t + \theta)$$

$$= Ae^{i(\omega t + \theta)}$$

$$= A\angle(\omega t + \theta)$$

$$= \ A\angle\omega t\ \angle\theta$$