# ELT

* $\overline{Z} = x + jy$ , $|\overline{Z}| = Z = \sqrt{x^2+y^2}$

* $\overline{Z} = Z\cos\theta + jZ\sin\theta$

$\overline{Z} = Z e^{j\theta}$ $\theta$ = rad

$\overline{Z} = Z \angle \theta°$ $\theta°$

$\overline{Y} = \frac{1}{\overline{Z}}$ $\overline{Z} = \frac{Z}{\sqrt{2}}$ $\varphi = tg^{-1}\left(\frac{img}{réel}\right)$

$U = R.i$ ; $\overline{U} = \overline{Z}.\overline{I}$

$Z_L = jX_L$ ; $X_L = L\omega$

$Z_c = -jX_c$ ; $X_c = \frac{1}{C\omega}$

$\underset{L}{i} \overset{\varphi}{<} u$ i en retard/u $\Rightarrow$ inductif (L)

$\underset{C}{i} \overset{\varphi}{>} u$ i en avance/u $\Rightarrow$ Capacitif (C)

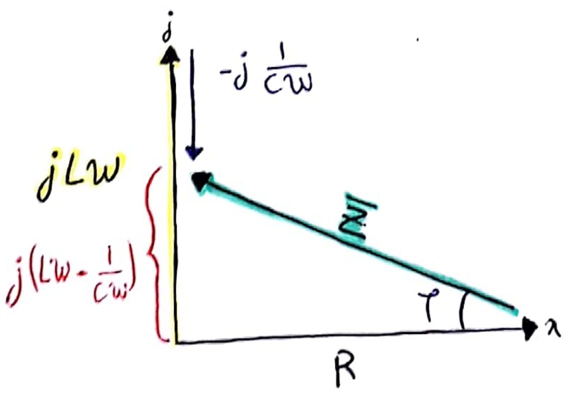
$\left(L\omega - \frac{1}{C\omega}\right)$

$>0$ $\Rightarrow$ inductif

$<0$ $\Rightarrow$ Capacitif

$=0$ $\Rightarrow$ Circuit en Résonance $\varphi = 0$
purement resistif

Diagramme Vectoriel de Fresnel




$tg = \frac{\text{مقابل}}{\text{مجاور}}$

$R \rightarrow$ active ; $L \rightarrow$ active / réactive ; $C \rightarrow$ réactive

$P = R.I^2$ , $P_a = U.I_a$

Just lorsque on a que active

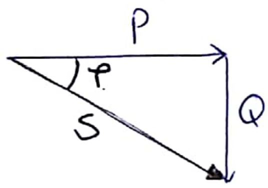
Théorème de Buchrot

$$S_T = \sqrt{P_T^2 + Q_T^2}$$

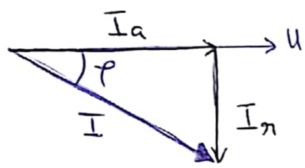
$$S_T = U.I_T$$

$$P = U.I.\cos\varphi$$

$$\boxed{f_p = \cos\varphi}$$




• $\bar{I} = I_a + j\, I_r$




Moteur $\boxed{\underset{\text{rendement}}{\eta} = \frac{P_u^{\text{utile}}}{P_a}}$

$$\boxed{C = \frac{P_T\,(\mathrm{tg}\,\varphi - \mathrm{tg}\,\varphi')}{\omega\, U^2}}$$

$$\bar{I} = I\, e^{-j\varphi} = I\cos\varphi - j\, I \sin\varphi$$

R.L

$\cos\varphi$ (AR)

- $I$ courant simple de ligne
- $J$ courant de phase (charge)
- $V$ tension simple
- $U$ tension composé (entre 2 phases)

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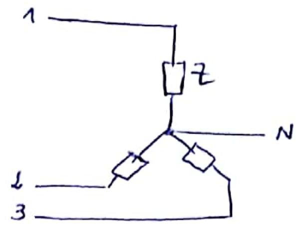
$\lambda$

$$\boxed{I = J}$$

$$V = \frac{U}{\sqrt{3}} \angle -30^\circ$$

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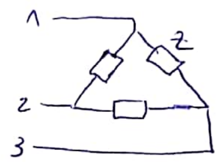
$\Delta$

$$\boxed{V = U}$$

$$I = \sqrt{3}\, J \angle -30^\circ$$

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$$\boxed{Z_\Delta = 3 Z_\lambda} \quad \boxed{C_\Delta = \frac{C_\lambda}{3}}$$

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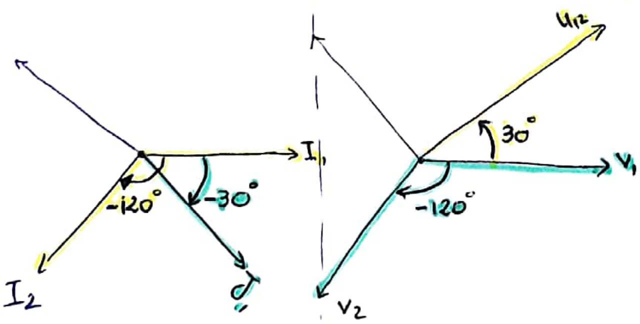


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$P = \sqrt{3}\, U.I \cos \varphi_z$ | $P = 3 V I \cos \varphi_z$

$Q = \sqrt{3}\, U.I \sin \varphi_z$ | $Q = 3 V.I \sin \varphi_z$

$S = \sqrt{3}\, U.I$ | $S = 3 V I$

$P = 3 R I^2$

$Q = 3 X I^2$

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## Ajout de C

$P_T = P_T'$ $\quad$ $Q_T' = Q_T + Q_C$

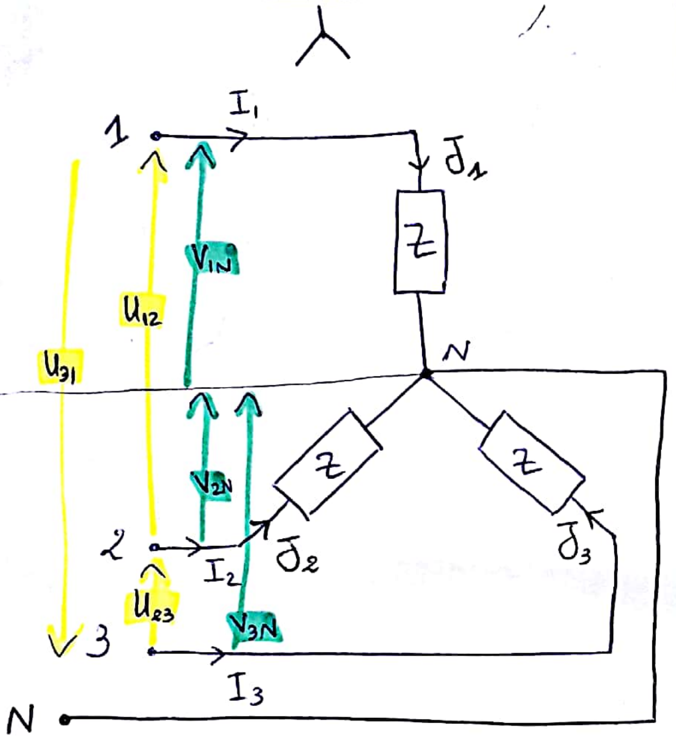
$$\boxed{C = \frac{P_1 (\mathrm{tag}\,\varphi - \mathrm{tag}\,\varphi')}{W \cdot U^2}}$$

$Q_c = -3 C_\lambda W V^2 = 3 \times I^2$

- $I$ courant de ligne
- $J$ " " phase (charge
- $V_{iN}$ tension simple
- $U$ tensions composé (entre 2 phases)

$$\boxed{Z_\Delta = 3Z_\lambda}$$

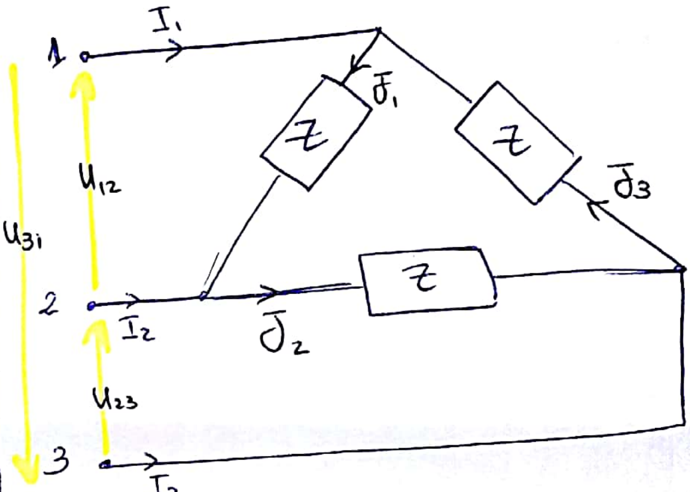
## λ




$$\boxed{I = J}$$

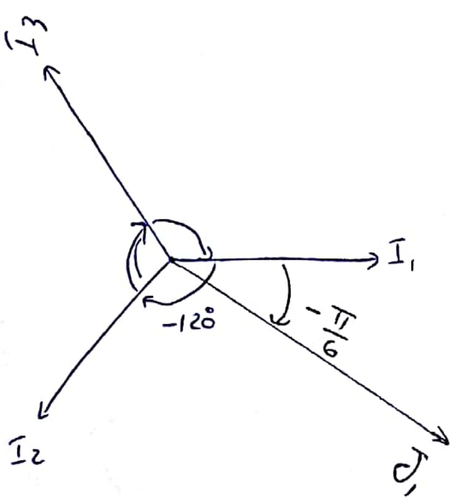
$$\boxed{V = \frac{U}{\sqrt{3}}} \qquad U = V\sqrt{3}\ \angle 30$$

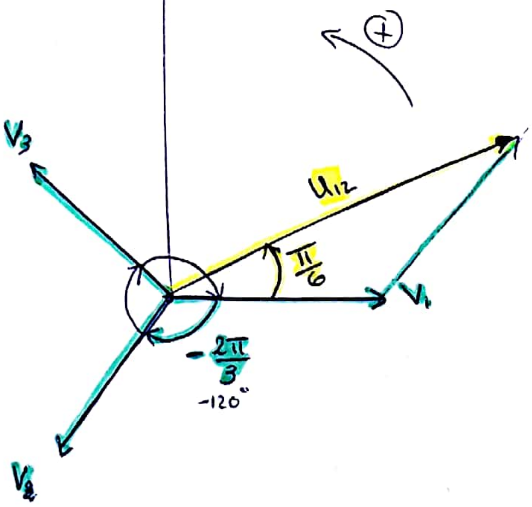
## Δ




$$\boxed{V = U}$$

$$\boxed{I = \sqrt{3}\,J}\ \angle -30$$




$U_{12} = V_1 - V_2$

$_{23} = V_2 - V_3$

$_{31} = V_3 - V_1$

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Mono

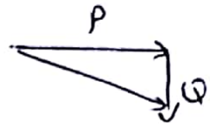
$U = \sqrt{3}\, V \angle{+30°}$

$I = \sqrt{3}\, J \angle{-30°}$

$P = \sqrt{3} \cdot U \cdot I \cos \varphi_z$

$Q = \sqrt{3}\, U \cdot I \sin \varphi_z$

$S = \sqrt{3}\, U \cdot I$




$I = \frac{V}{Z}$

| Réseau \ M | V 127/220 U | 220/380 |
|---|---|---|
| 127/220 | $U = \sqrt{3}\, V$ <br> Y | $U = V$ <br> $\Delta$ |
| 220/380 | $U = 3V$ <br> مكانش | $U = \sqrt{3}\, V$ <br> Y |

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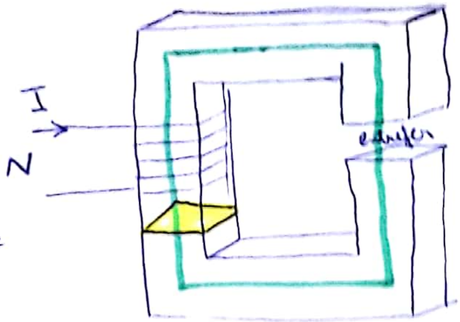
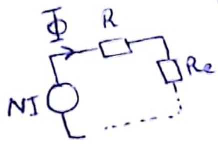


N tour

l parcours moyen

S section

* Reluctance

$$R = \frac{l}{\mu \cdot S} \ (At/Wb)$$

$\mu = \mu_0 \cdot \mu_r$

$\mu_0 = 4\pi \cdot 10^{-7}$

* Flux

$$\Phi = \frac{NI}{R_{Tot}} \ (Wb)$$

* densité du flux

$$B = \frac{\Phi}{S} \ (Tesla)$$

* Inductance

$$L = \frac{N^2}{R} = \boxed{\frac{N(\Phi + \Phi_f)}{I}}$$

$$= \underbrace{\frac{N\Phi}{I}}_{L_m} + \underbrace{\frac{N\Phi_f}{I}}_{L_f}$$

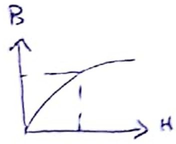
$L_{\text{magnétisante}}$

$L_{\text{fuite}}$

• Materiau **linéaire** ✓

$$\boxed{\mathcal{F}_{mm} = N.I = R\,\Phi}$$

* Materiau **non linéaire** ✗




$$\boxed{\mathcal{F}_{mm} = NI = H.l}$$

• champs magnetique $H$ (At/m)