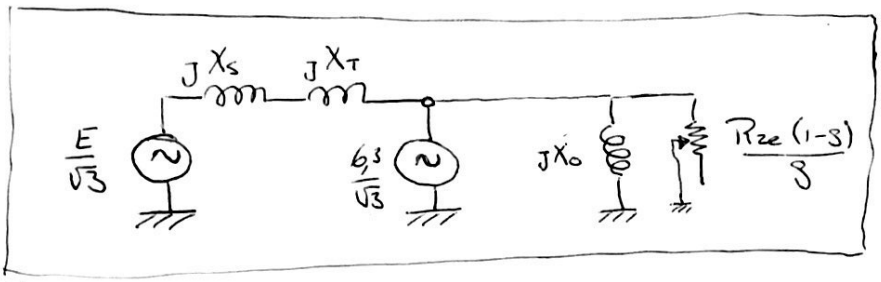
Problema 2 — 2° Parcial 2019 — Electrotecnia

A)



$$X_o = \frac{U/\sqrt{3}}{I_o}$$

$$\boxed{X_o = \frac{6300/\sqrt{3}}{60} = 60\,\Omega}$$

$$P_M = \frac{U_n^2}{R_{ze}}(1-s).s$$

$$\boxed{s = \frac{n_s - n}{n_s} = \frac{1500 - 1470}{1500} = 2\%}$$

$$\Rightarrow \boxed{R_{ze} = \frac{U_n^2}{P_n}(1-s)s = 0{,}52\,\Omega}$$

$$\boxed{X_T = u.\frac{U_n^2}{S_n} = 8\%.\frac{6{,}3^2}{2} = 1{,}59\,\Omega}$$

$$\boxed{X_S = u.\frac{U_n^2}{S_n} = 15\%.\frac{6{,}3^2}{2} = 3\,\Omega}$$

B)

- $P_E = P_M = C.\omega$
- $\omega = n.2\pi/60$
- $C = 5{,}5.n$
- $n = n_s(1-s)$
- $P_E = \frac{U_n^2}{R_{ze}}(1-s).s$

$\Rightarrow$

$$\frac{U_{Red}^2}{R_{ze}}(1-s)s = 5{,}5.\frac{2\pi}{60}.n_s^2(1-s)^2$$

$$s\left[\frac{U_R^2}{R_{ze}} + \frac{(5{,}5)2\pi n_s^2}{60}\right] = \frac{(5{,}5)2\pi.n_s^2}{60}$$

$$s\left[\frac{60}{(5{,}5)2\pi n_s^2}.\frac{U_R^2}{R_{ze}} + 1\right] = 1$$

$$\Rightarrow s = 1{,}7\%$$

$$\boxed{P = \frac{U_{Red}^2}{R_{ze}}.(1-s)(s) = 1{,}25\,MW}$$

$$\boxed{Q = Q_o = \frac{U^2}{X_o} = 654\,k\omega}$$

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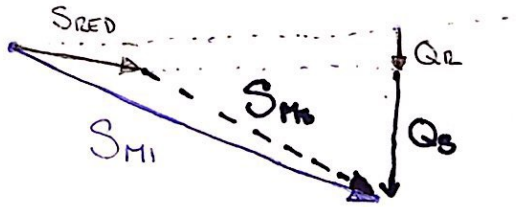
c)

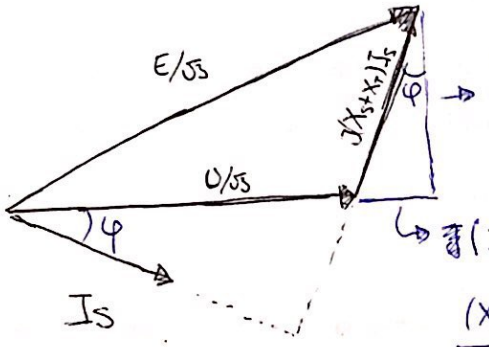


$P_{MI} = P_{MS} + P_{RED} = 1{,}25\,MW$
$P_{MS}^{MAX} = 0{,}8\,MW$
$\Rightarrow P_{RED} = 0{,}45\,MW$

$S_{RED} = P_{RED} / FP = 477\,kVA$

$Q_{RED} = \sqrt{S_{RED}^2 - P_{RED}^2} = 149\,kVAr$

$Q_{MS} = Q_{MI} - Q_{RED} = 506\,kVAr$



$(X_T+X_S) I_S \cos\varphi = \dfrac{(X_T+X_S) P}{\sqrt{3}.U}$

$(X_T+X_S) I_S \operatorname{sen}\varphi = \dfrac{(X_T+X_S) Q}{\sqrt{3}\,U}$

$\Rightarrow \left(\dfrac{E}{\sqrt{3}}\right)^2 = \left(\dfrac{U}{\sqrt{3}} + \dfrac{(X_S+X_T)Q}{\sqrt{3}.U}\right)^2 + \left(\dfrac{(X_S+X_T).P}{\sqrt{3}U}\right)^2 \Rightarrow E = 6691\,V$

$\Rightarrow \boxed{i = \dfrac{E\left(\frac{2}{6{,}3}\right)}{945} = 2{,}25\,A}$

$S_{MS} = \sqrt{P_{MS}^2 + Q_{MS}^2} = 946\,kVA < (S_T, S_{MS})$

d) $S_{RED} = \sqrt{P_R^2 + Q_R^2} = 476\,kVA$

$\boxed{I_R = \dfrac{S_{RED}}{\sqrt{3}\,U_{RED}} = 43{,}7\,A}$