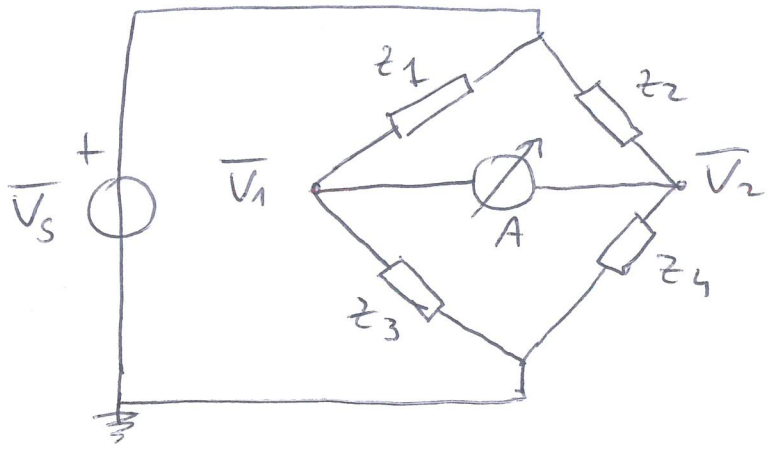
AC REGIME 2

2)



Le $\bar{I}_A = 0 \Rightarrow \bar{V}_1 = \bar{V}_2$

$$\frac{z_3}{z_1+z_3} = \frac{z_4}{z_2+z_4} \Rightarrow z_1 z_4 = z_2 z_3$$

$$z_1 = \frac{R_1}{1+j\omega R_1 C} \; ; \; z_2 = R_2 \; ; \; z_3 = R_3 \; ; \; z_4 = R_x + j\omega L_x$$

$$R_2 R_3 = \frac{R_1(R_x + j\omega L_x)}{1+j\omega R_1 C}$$

$$R_2 R_3 + j\omega C R_1 R_2 R_3 = R_1 R_x + j\omega R_1 L_x$$

$$R_1 R_x = R_2 R_3 \Rightarrow R_x = \frac{R_2 R_3}{R_1}$$

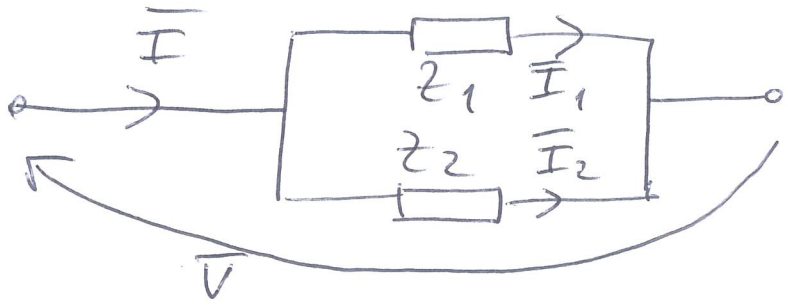
$$R_1 L_x = C R_1 R_2 R_3 \Rightarrow L_x = C R_2 R_3$$

Le : $R_1 = 10\,k\Omega$, $C = 0.5\,\mu F$, $R_2 = 400\,\Omega$, $R_3 = 600\,\Omega$

$$R_x = 24\,\Omega \; ; \; L_x = 120\,mH$$

AC REGIME 2

3)



$Z_1 = 4+j4\ \Omega$; $Z_2 = 12+j6\ \Omega$

$Q = 2500\ VAR$

$$Y_p = Y_1 + Y_2 = 0.192 - 0.158j = 0.25 e^{-j0.6904}\ \Omega^{-1}$$

$$\frac{P}{Q} = \cot\varphi \Rightarrow P = Q \cot\varphi = 3026\ W$$

$$P = G|\bar{V}|^2 \ ; \ Q = -B|\bar{V}|^2$$

$$|\bar{V}|^2 = \frac{Q}{-B} = \frac{2500}{0.158} = 15822\ V^2$$

$$|\bar{V}| = 126\ V$$

$$P_{ap} = \sqrt{P^2+Q^2} = 3925\ VA \Rightarrow |I| = \frac{P_{ap}}{|\bar{V}|} = 31\ A$$

$$|I_1|^2 = \frac{|Z_2|^2}{|Z_1+Z_2|^2}|\bar{I}|^2 \Rightarrow |\bar{I}_1| = 22.2A$$

$$|\bar{I}_2|^2 = \frac{|Z_1|^2}{|Z_1+Z_2|^2}|\bar{I}|^2 \Rightarrow |I_2| = 9.37A$$

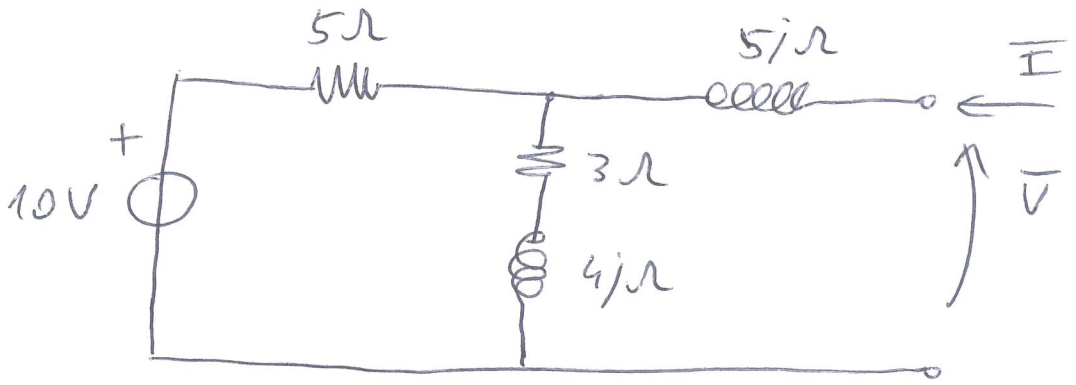
$$P_1 + P_2 = P \ ; \ Q_1 + Q_2 = Q$$

$$P_1 = R_1|\bar{I}_1|^2 = 1974\ W \qquad P_2 = R_2|\bar{I}_2|^2 = 1053\ W$$

$$Q_1 = X_1|\bar{I}_1|^2 = 1974\ VAR \qquad Q_2 = X_2|I_2|^2 = 526\ VAR$$

AC REGIME 2

7)



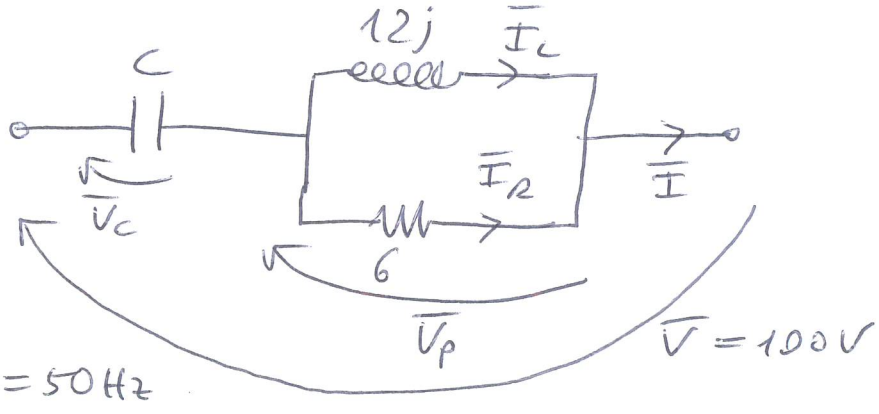
$$z_{eq} = \frac{5(3+4j)}{5+3+4j} + 5j = 2.5 + 6.25j\ \Omega$$

$$\bar{V}_{eq} = \frac{3+4j}{5+3+4j}\,10 = 5.6e^{j\,0.463}\ V$$

$$\bar{I}_{eq} = \frac{10}{5+\frac{5j(3+4j)}{3+4j+5j}} \cdot \frac{3+4j}{3+4j+5j} = 0.83\,e^{-j\,0.726}\ A$$

AC REGIME 2

10)



$$\bar{z} = -\frac{j}{\omega C} + \frac{6(12j)}{6+12j} = 4.8 + j2.4 - j\frac{1}{\omega C}$$

Pe $\frac{1}{\omega C} = 2.4 \Rightarrow z = 4.8\,\Omega$ $\bar{V}$ in fase con $\bar{I}$

$C = 1.327\,\mu F$; $\bar{I} = \frac{\bar{V}}{4.8} = 20.8\ A$

$P = 100 \times 20.8 = 2083\ W$

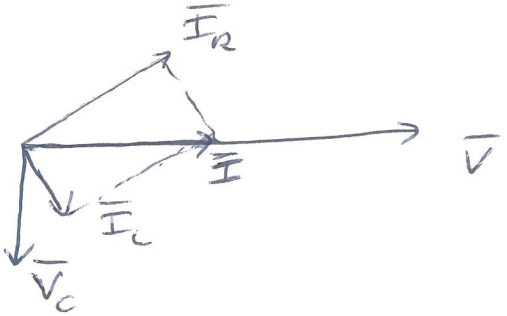
$\bar{I}_R = \frac{12j}{6+12j}\,20.8 = 18.6\,e^{j0.46}\ A$

$P_R = R\,|\bar{I}_R|^2 = 2083\ W$

$\bar{I}_L = \frac{6}{6+12j}\,20.8 = 9.3\,e^{-j1.107}\ A$

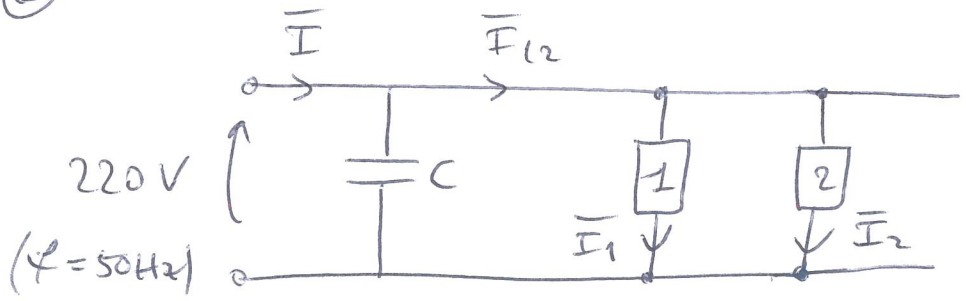
$Q_L = \omega L\,|\bar{I}_L|^2 = 1038\ VAR$

$Q_C = -\frac{1}{\omega C}\,|\bar{I}|^2 = -1046\ VAR$



AC REGIME 2

12) (c)



$P_1 = 50\ kW$ $\quad \cos\varphi_1 = 0.60$ (ritardo induttivo)

$P_2 = 20\ kW$ $\quad \cos\varphi_2 = 0.95$ (anticipo capacitivo)

$$\begin{cases} P_1^{app} = \dfrac{P_1}{\cos\varphi_1} = 83.3\ kVA \\ Q_1 = \sqrt{P_1^{app\,2} - P_1^2} = 66.6\ kVAR \\ |\bar{I}_1| = \dfrac{P_1^{app}}{V} = 379\ A \end{cases}$$

$$\begin{cases} P_2^{app} = \dfrac{P_2}{\cos\varphi_2} = 21.05\ kVA \\ Q_2 = -\sqrt{P_2^{app\,2} - P_2^2} = -6.57\ kVAR \\ |\bar{I}_2| = \dfrac{P_2^{app}}{V} = 95.7\ A \end{cases}$$

$$P_{12} = P_1 + P_2 = 70\ kW$$

$$Q_{12} = Q_1 + Q_2 = 60.09\ kVAR$$

$$P_{12}^{app} = \sqrt{P_{12}^2 + Q_{12}^2} = 92.3\ kVA$$

$$|\bar{I}_{12}| = \frac{P_{12}^{app}}{V} = 419.3\ A \qquad \cos\varphi_{12} = \frac{P_{12}}{P_{12}^{app}} = 0.759$$

AC REGIME 2

12) (b)

RIF. TOTALE :

$$Q_c = -60.09 \text{ kVAR}$$

$$C = \frac{|Q_c|}{\omega V^2} = 3.952 \text{ mF}$$

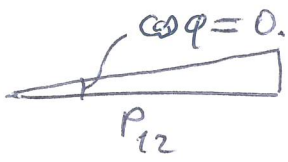
$$\Rightarrow \quad P_R = P_{12} + P_c = P_1 + P_2 + P_c = 70 \text{ kW}$$

$$Q_R = Q_{12} + Q_c = 0$$

$$\cos\varphi_R = 1$$

$$P_R = |I_R| \cdot V \Rightarrow \quad |I_R| = \frac{P_R}{V} = 318 \text{ A}$$

RIF. PARZIALE :



$$\Delta Q = Q_{12} - Q' = 26.39 \text{ kVAR}$$

$$P'_{ap} = \frac{P_{12}}{0.9} = 77.7 \text{ kVA}$$

$$Q' = \sqrt{P'^2_{ap} - P_{12}^2} = 33.7 \text{ kVAR}$$

$$|I'| = \frac{P'_{ap}}{V} = 353.5 \text{ A}$$

$$C' = \frac{\Delta Q}{\omega V^2} = \frac{26.39 \times 10^3}{\omega V^2} = 1.735 \text{ mF}$$