COMPITO ELETTROTECNICA 10-12-2014

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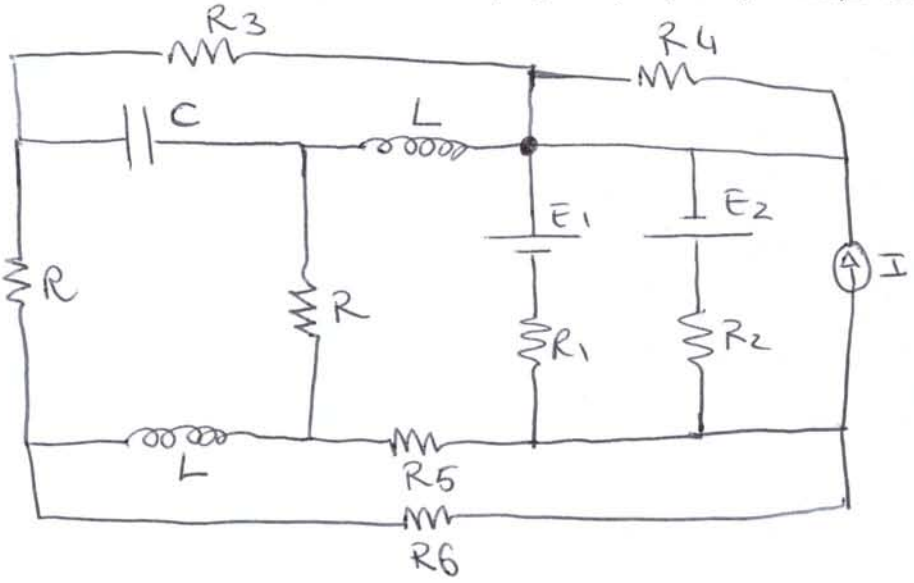
Corso di Laurea: _____

Esercizio 1:

Il circuito in figura è a regime. Determinare le potenze generate ed erogate da E_1-R_1 ed E_2-R_2.

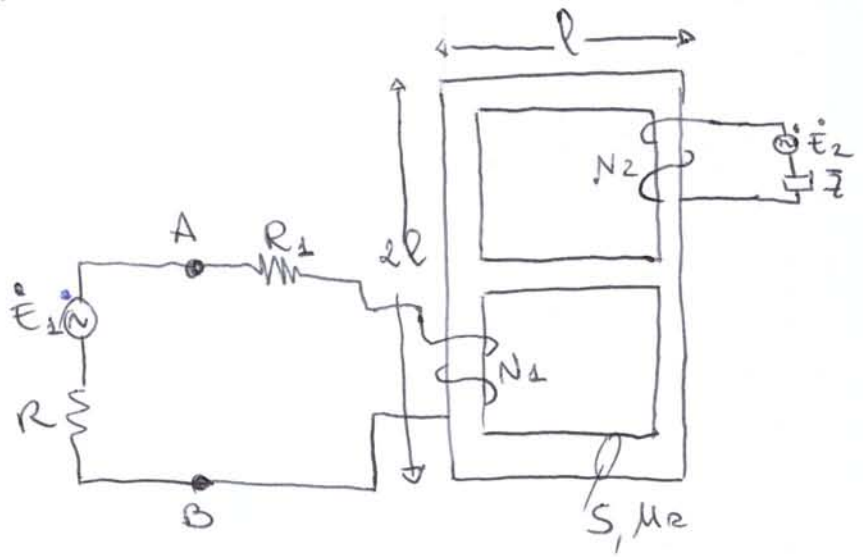
E_1 = 5V; E_2= 7V; R=1Ω; R_1=R_5=R_6= 5Ω; R_2= 3Ω; R_3= 3Ω; R_4= 4Ω; I=2A;L=3mH; C=3mF.



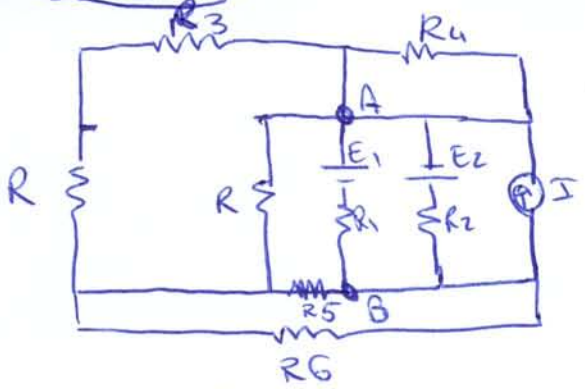
Esercizio 2:

Dato il seguente circuito a regime, determinare la capacità da inserire tra i punti A e B, per rifasare il sistema a cos Φ=0.9.

$\dot{E}_1 = 5V$; $\dot{E}_2 = 7V$; **$\overline{Z}$=3+j Ω; R = 5 Ω; R1= 3 Ω ;N_1=200; N_2=250;ω=10 rad/sec; l=2cm, S=1,5cm^2; μ_r= 1000.**



ES. N°1

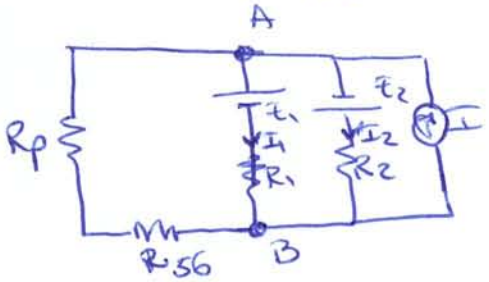


R_4 Trascurabile in quanto in //a

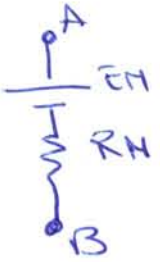
$R_{56} = R_5 // R_6$

$R_{13} = R + R_3$

$R_0 = R_5 // R$



$\Rightarrow$



$$E_M = \frac{\frac{E_1}{R_1} - \frac{E_2}{R_2} + I}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{(R_p + R_5)}}$$

$V_{AB} = E_M$

$V_{AB} - E_1 = I_1 R_1 \Rightarrow I_1 = \frac{V_{AB} - E_1}{R_1}$

$V_{AB} + E_2 = I_2 \cdot R_2 \Rightarrow I_2 = \frac{V_{AB} + E_2}{R_2}$

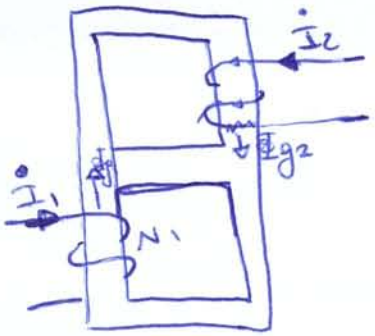
$P_{g\,E_1-R_1} = E_1 \cdot (-I_1)$

$P_{e\,E_1-R_1} = V_{AB}(-I_1)$

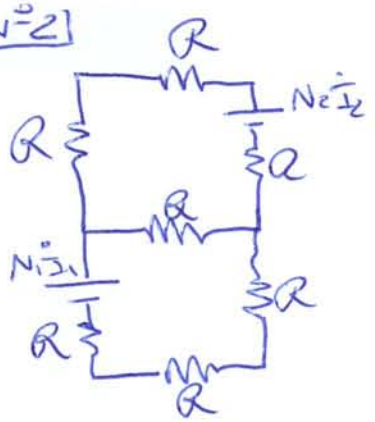
$P_{g\,E_2-R_2} = E_2\,(I_2)$

$P_{e\,E_2-R_2} = V_{AB} \cdot I_2$

[ES. N°2]



$\Rightarrow$



$$\mathcal{R} = \frac{l}{\mu_0 \mu_r S} = 1.06 \cdot 10^5 \text{ H}$$

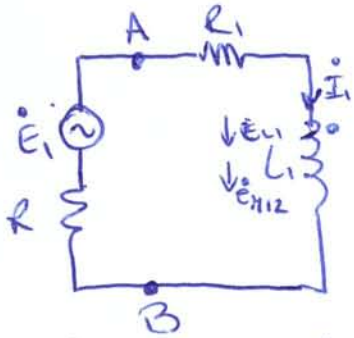
$$\mathcal{R}_{eq1} = (3\mathcal{R} \,//\, \mathcal{R}) + 3\mathcal{R} = \frac{}{}$$

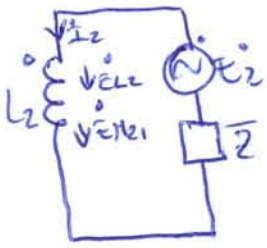
$$\mathcal{R}_{eq2} = (3\mathcal{R} \,//\, \mathcal{R}) + 3\mathcal{R}$$

$$\mathcal{R}_{eq} = \mathcal{R}_{eq1} = \mathcal{R}_{eq2} = 4 \cdot 10^5 \text{ H}$$

$$L_1 = \frac{N_1^2}{\mathcal{R}_{eq}} = 0.1 \text{H}; \quad M_{12} = \frac{N_1 N_2}{\mathcal{R}_{eq}} \alpha_{12} = \frac{N_1 N_2}{\frac{15}{4}\mathcal{R}} \cdot \frac{\mathcal{R}}{3\mathcal{R}+\mathcal{R}} = \frac{N_1 N_2}{15\mathcal{R}} = 0.03 \text{ H}$$

$$L_2 = \frac{N_2^2}{\mathcal{R}_{eq}} = 0.1 \text{H} \qquad M_{12} = M_{21} \quad (>0)$$





$$\begin{cases} \dot{E}_1 + \dot{E}_{L1} + \dot{E}_{M12} = \dot{I}_1 (R + R_1) \\ \dot{E}_2 + \dot{E}_{L2} + \dot{E}_{M21} = \dot{I}_2 \bar{Z} \end{cases}$$

$$\begin{cases} \dot{E}_1 - j\omega L_1 \dot{I}_1 - j\omega M_{12} \dot{I}_2 = \dot{I}_1 (R + R_1) \\ \dot{E}_2 - j\omega L_2 \dot{I}_2 - j\omega M_{21} \dot{I}_1 = \dot{I}_2 \bar{Z} \end{cases}$$

$\Rightarrow \dot{I}_1$ e $\dot{I}_2$

$\dot{I}_1 = (0{,}57 - j0{,}11)$ A

$\dot{I}_2 = (1{,}04 - j1{,}2)$

$$\bar{S}_{AB} = \dot{V}_{AB} \cdot \overset{\cup}{\dot{I}_1} = (\dot{E}_1 - \dot{I}_1 R) \cdot \overset{\cup}{\dot{I}_1} = P_{CA} + j Q_{CA}$$

$$C = \frac{Q_{CA} - P_{CA} \operatorname{tg}\varphi}{\omega \cdot |\dot{V}_{AB}|^2}$$

$$\bar{S}_{AB} = \dot{V}_{AB} \cdot \overset{\cup}{\dot{I}_1} = (2{,}15 + j0{,}55) \cdot (0{,}57 + j0{,}11) = (1{,}16 + j0{,}55) \text{ VA}$$

$$\varphi_{CA} = \operatorname{arctg} \frac{0{,}55}{1{,}16} = 25{,}36 \quad \Rightarrow \cos\varphi_{CA} = 0{,}903 > \cos\varphi_R$$

Non si deve sfasare in quanto si è ottenuto un $\cos\varphi_{CA} > \cos\varphi$ che ovvero significa che si è ottenuto un fattore di potenza maggiore di quello richiesto.