Compito di Elettrotecnica

15 Novembre 2021

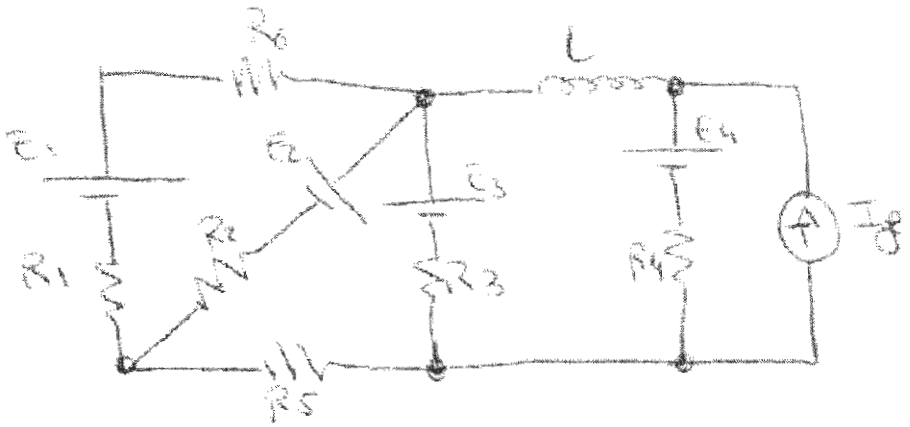
Nome e Cognome .....

Matricola.....

Corso di Laurea.....

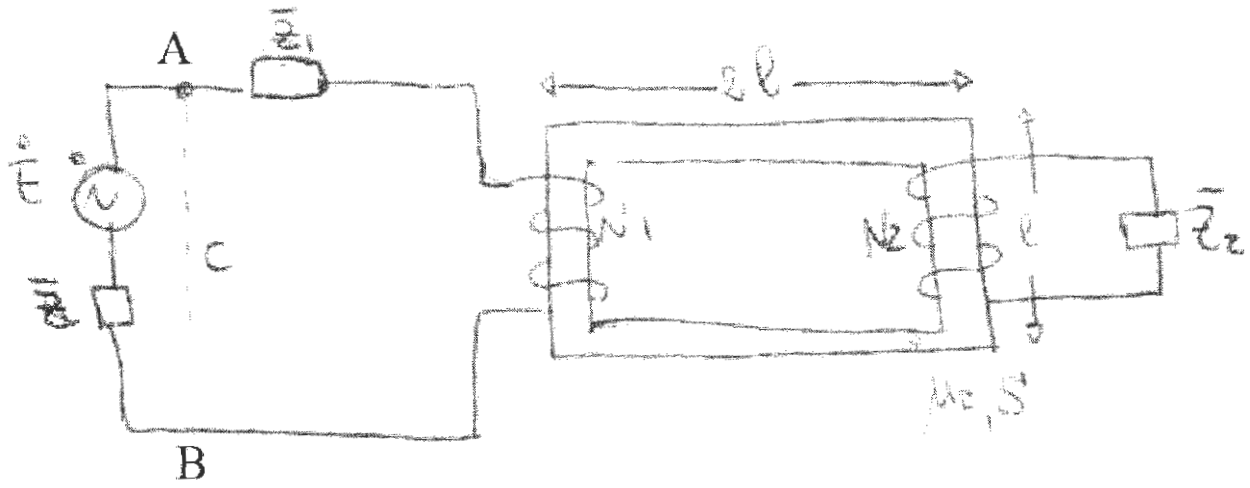
ES.1–Il sistema si trova a regime. Determinare l'energia immagazzinata in L e la potenza generata ed erogata dal generatore reale di tensione E_1 R_1.

E_1 = 5V; E_2=3V; E_3 =1V; R_1= R_3= 2Ω; R_2=R_4=6 Ω; R_5 = R_6 = 5 Ω; Ig=3A; L=1mH

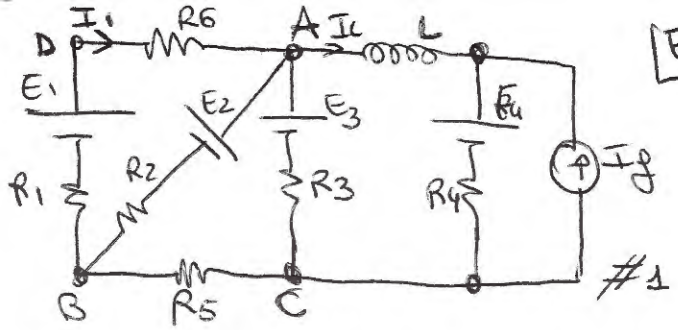


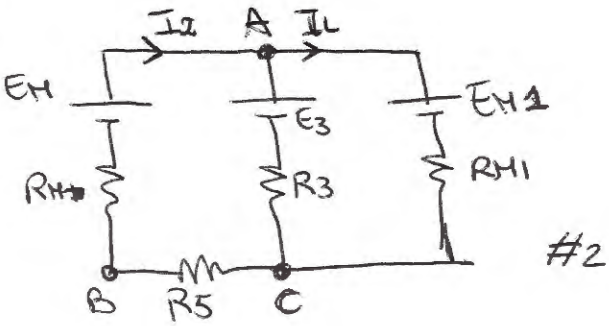
ES.2 – Dato il circuito in figura, determinare la capacità **C** da inserire tra i punti A e B per rifasare totalmente il carico a valle e la potenza attiva sul carico $\bar{z}_2$

$\dot{E} = 3 + j\,V$; $\bar{z} = 1 + 2j\,\Omega$; $\bar{z}_1 = 3 - 5J\,\Omega$; $\bar{z}_2 = 3 - 2J\,\Omega$; μ_r =1000; l=5cm; S=50cm^2; f= 50Hz; N1=50; N2=100



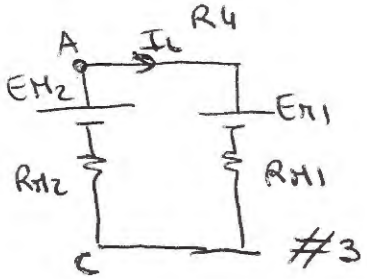
ES. N°1





$$E_M = \frac{\frac{E_1}{R_1+R_6} + \frac{E_2}{R_2}}{\frac{1}{R_1+R_6} + \frac{1}{R_2}} \qquad R_M = \frac{1}{\frac{1}{R_1+R_6} + \frac{1}{R_2}}$$

$$E_{M1} = \frac{E_4/R_4 + I_g}{\frac{1}{R_4}} \qquad R_{M_2} = R_4$$



$$E_{M2} = \frac{E_M/(R_M+R_5) + E_3/R_3}{\frac{1}{R_M+R_5} + \frac{1}{R_3}}$$

$$R_{M2} = \frac{1}{\frac{1}{R_M+R_5} + \frac{1}{R_3}}$$

$$I_L = \frac{E_{M2} - E_{M1}}{R_{M2} + R_{M1}} \qquad W = \frac{1}{2} L I_L^2$$

$P_{gen}(E_1) = E_1 \cdot I_1$

$P_{erg}(E_1 - R_1) = V_{DE} \cdot I_1 = (E_1 - I_1 R_1) I_1$

Dal # 3

$V_{AC} = E_{M2} - I_L R_{M2}$

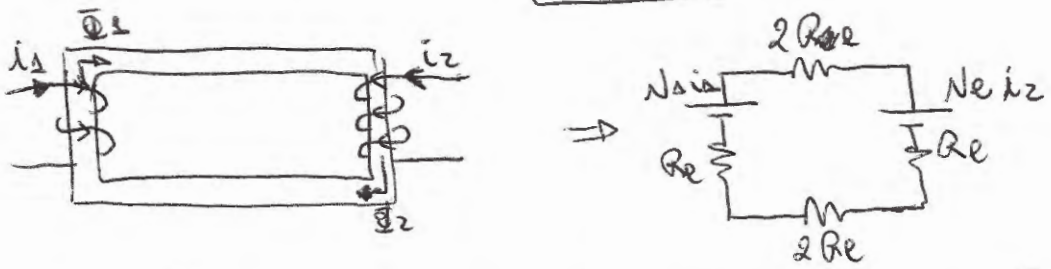
Dal #2 : $V_{AC} = E_M - I_2 (R_M + R_5) \Rightarrow I_2 = \frac{E_M - V_{AC}}{R_M + R_5}$

$V_{AB} = E_M - I_2 R_M$

Dal #1 : ~~VDE~~

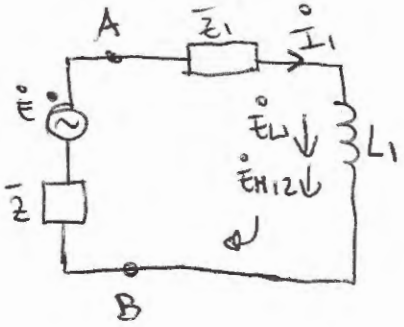
$V_{AB} = E_1 - I_1 (R_1 + R_6) \Rightarrow I_1 = \frac{E_1 - V_{AB}}{R_1 + R_6}$

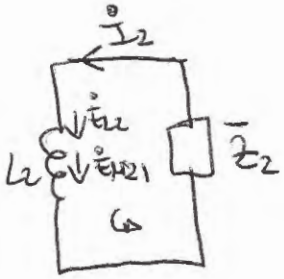
ES. N°2



$$\mathcal{R}_e = \frac{l}{\mu_0 \mu_r S} \Rightarrow \mathcal{R}_{eq} = \mathcal{R}_e + 2\mathcal{R}_e + 2\mathcal{R}_e + \mathcal{R}_e = 6\mathcal{R}_e$$

$$L_1 = \frac{N_1^2}{\mathcal{R}_{eq}} \qquad L_2 = \frac{N_2^2}{\mathcal{R}_{eq}} \qquad M_{12} = \frac{N_1 N_2}{\mathcal{R}_{eq}} > 0$$





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

$$\begin{cases} \dot{E} - j\omega L_1 \dot{I}_1 - j\omega M_{12} \dot{I}_2 = \dot{I}_1 (\bar{Z}_1 + \bar{Z}) \\ 0 - j\omega L_2 \dot{I}_2 - j\omega M_{21} \dot{I}_1 = \dot{I}_2 \bar{Z}_2 \end{cases} \Rightarrow \dot{I}_1 \text{ e } \dot{I}_2$$

Procedo con il calcolo di $\dot{V}_{AB} = \dot{E} - \dot{I}_1 \bar{Z}$

$$\bar{S} = \dot{V}_{AB} \cdot \dot{I}_1^* = P_{AB} + jQ_{AB}$$

se $Q_{AB} < 0 \Rightarrow$ non è necessario rifasare

se $Q_{AB} > 0 \Rightarrow C_{rif} = \frac{Q_{AB}}{\omega V_{AB}^2}$ con $V_{AB} = |\dot{V}_{AB}|$

Per determinare la potenza attiva su $\bar{Z}_2$:

$$P_{\bar{Z}_2} = \mathrm{Re}\{\bar{Z}_2\} \cdot I_2^2$$

dove I_2 è il valore efficace di $\dot{I}_2$