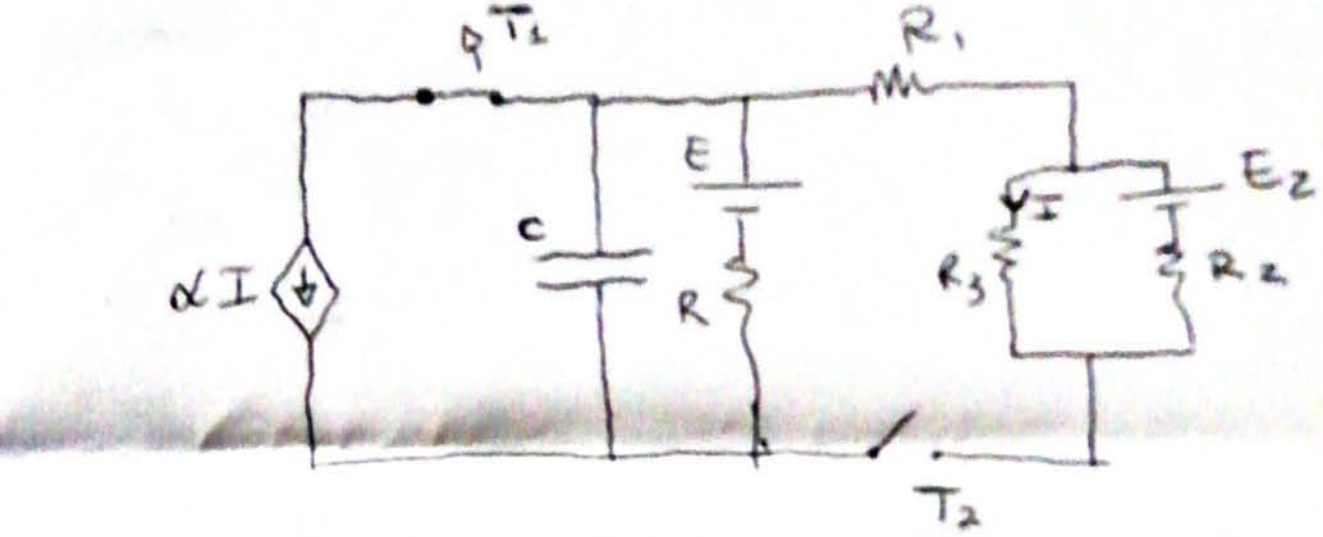
COMPITO ELETTROTECNICA 26-06-2019

Allievo _____ Matricola: _____

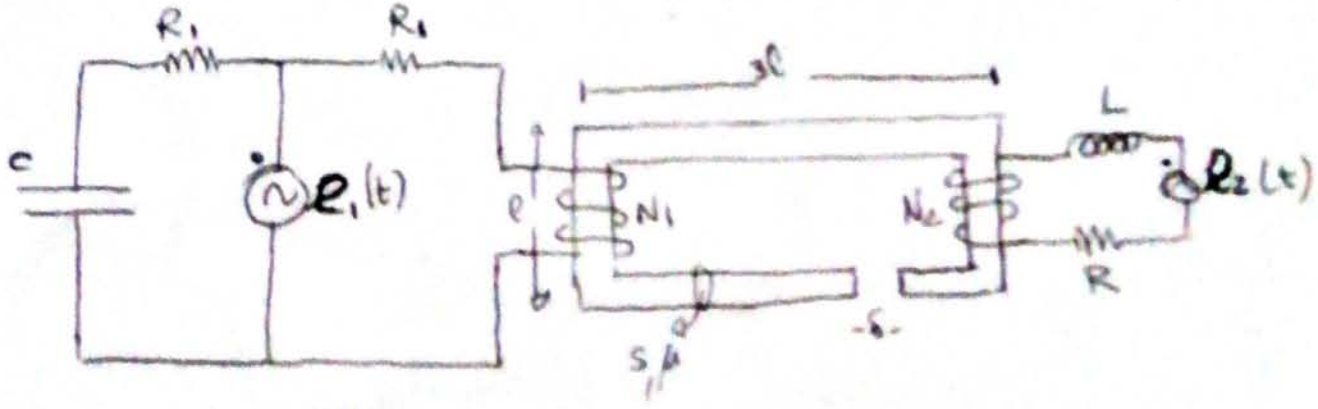
Corso di Laurea: _____

Esercizio 1:
Il circuito rappresentato è a regime. All'istante t=0s il tasto T1 si apre e il tasto T2 si chiude. Determinare il valore della tensione $v_c(t)$ ai capi del condensatore. Inoltre determinare l'energia immagazzinata nel condensatore dopo t=0.2ms.

E=2V, E_2=6V, R_1=2Ω, R_2=4Ω, R_3=5Ω, R=7Ω, C=1μF, α=3.



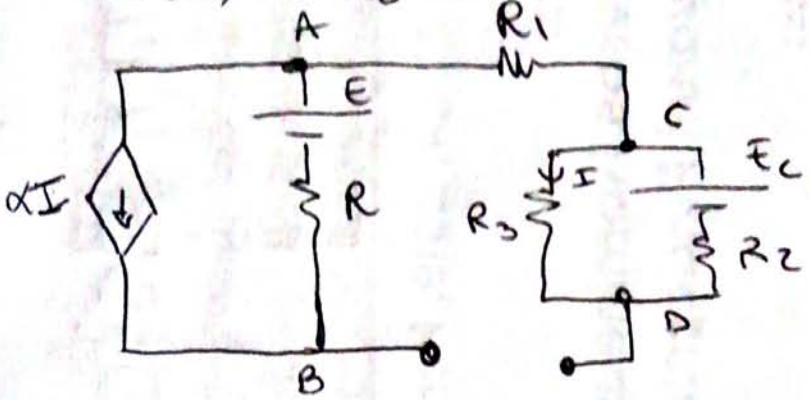
Esercizio 2:
Il sistema di figura si trova a regime. Determinare il valore della potenza attiva su R.
$e_1(t) = 2\sqrt{2}\sin(wt + \frac{\pi}{2})$ V, $e_2(t) = 2\sin(wt + \frac{\pi}{6})$, ω=314rad/s, R_1=10Ω; R=5Ω, N_1 = 80, N_2 = 100; l=5cm, S=50cm^2, δ=2mm, μ_r=1000, L=10mH; C=2mF.



ES. N° 1

- T_1 chiuso ; T_2 a petto

$v_c(0) = V_{AB}$

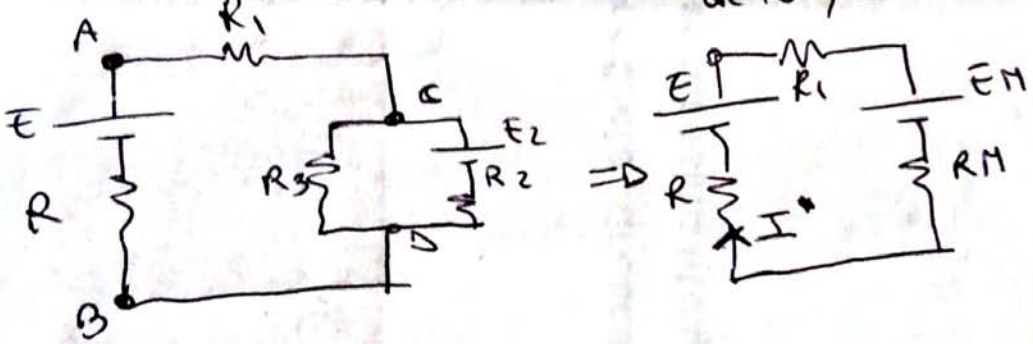


$$I = \frac{E_2}{R_2 + R_3}$$

$$V_{AB} - E = -\alpha I \cdot R \Rightarrow V_{AB} = E - \alpha I R$$

- T_2 a petto ; T_2 chiuso

$v_c(\infty) = V_{AB}$



$$E_M = \frac{\frac{E_2}{R_2}}{\frac{1}{R_2} + \frac{1}{R_3}}$$

$$R_M = \frac{1}{\frac{1}{R_2} + \frac{1}{R_3}}$$

$$I^* = \frac{E - E_M}{R + R_1 + R_M}$$

$$V_{AB} = E - I^* R$$

$$v_c(t) = V_{\infty} e^{-t/\tau} + V_{c\infty}\left(1 - e^{-t/\tau}\right)$$

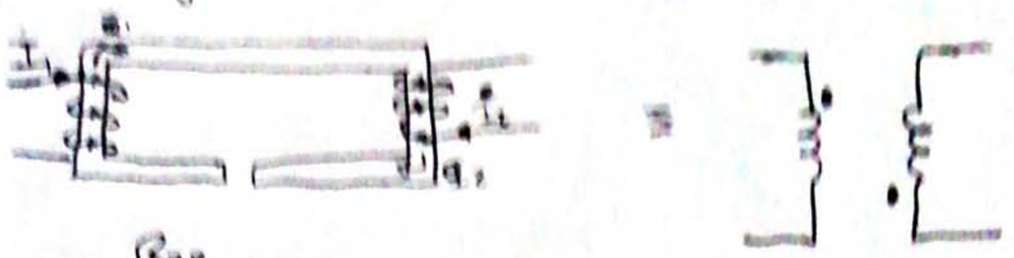
$$\tau = R_c C$$

$$R_c = \left(R_3 // R_2\right) + R_1 \,] \,// R$$

$$E_c = \frac{1}{2} C V_c^2 (t = 0.2\,ms)$$

(ES N°2)

Trasformiamo il mezzo ferromagnetico nell'eq. elettrico:

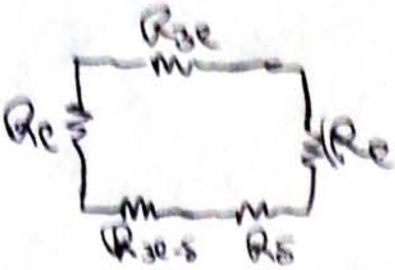


$e_1(t) = 2\sqrt{2}\,\text{sen}(\omega t + \frac{\pi}{2})$

$\rightarrow \dot{E}_1 = j2$

$e_2(t) = 2\,\text{sen}(\omega t + \frac{\pi}{4})$

$\rightarrow \dot{E}_2 = \sqrt{2}\left(\frac{\sqrt{2}}{2} + j\frac{1}{2}\right)$ ✓



$\mathcal{R}_e = \frac{\ell}{\mu_0 \mu_r S}$

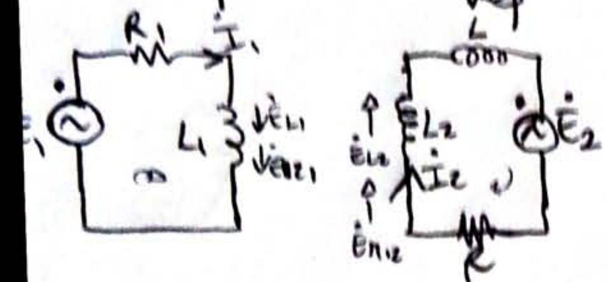
$\mathcal{R}_{3\ell} = 3\,\mathcal{R}_e$

$\mathcal{R}_{(3\ell-\delta)} = \frac{(3\ell - \delta)}{\mu_0 \mu_r S'}$

$\mathcal{R}_\delta = \frac{\delta}{\mu_0 S}$

$\mathcal{R}_{eq} = 2\mathcal{R}_e + \mathcal{R}_{3\ell} + \mathcal{R}_{(3\ell-\delta)} + \mathcal{R}_\delta$

$L_1 = \frac{N_1^2}{\mathcal{R}_{eq}}$ $\quad L_2 = \frac{N_2^2}{\mathcal{R}_{eq}}$ $\quad M_{12} = M_{21} = \sqrt{L_1 L_2}$



Il ramo in parallelo al gen. $\dot{E}_1$ può trascurarsi in quanto $\dot{E}_1$ gen. di tens. prevalente.

$$\begin{cases} \dot{E}_1 + \dot{E}_{L1} + \dot{E}_{M21} = \dot{I}_1 R_1 \\ -\dot{E}_2 + \dot{E}_{L2} + \dot{E}_{M12} = \dot{I}_2 (R + j\omega L) \end{cases}$$

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

Dal sistema ricavo $\dot{I}_1$

$P_R = R\dot{I}_2^2$