

Compito di Elettrotecnica

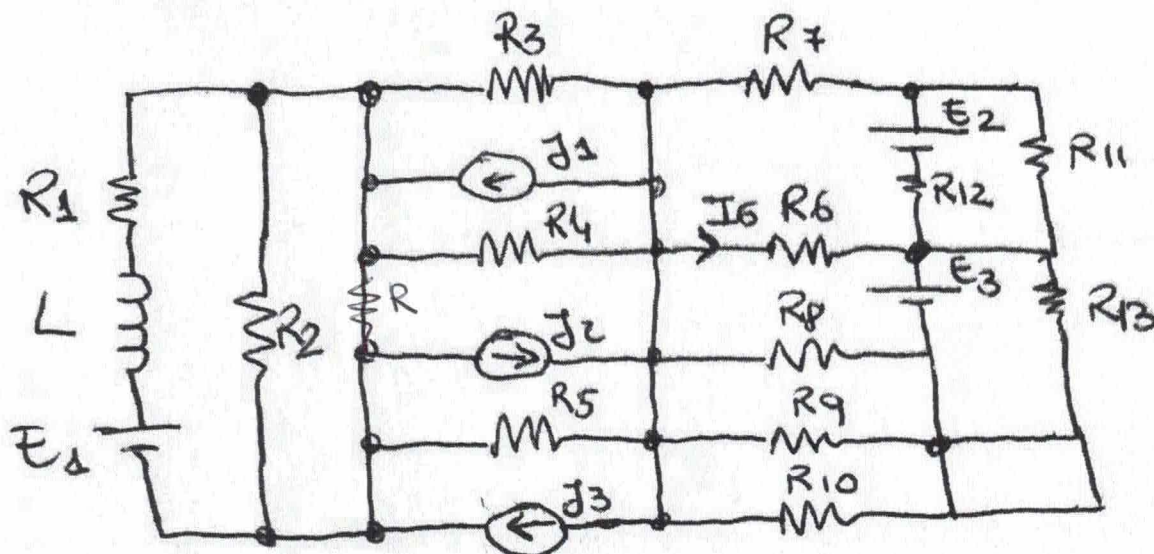
20 Giugno 2023

Nome e CognomeMatricola.....

Corso di Laurea.....

ES.1—Il sistema si trova a regime. Determinare l'energia immagazzinata in L e la corrente I_6 che scorre sulla resistenza R_6 .

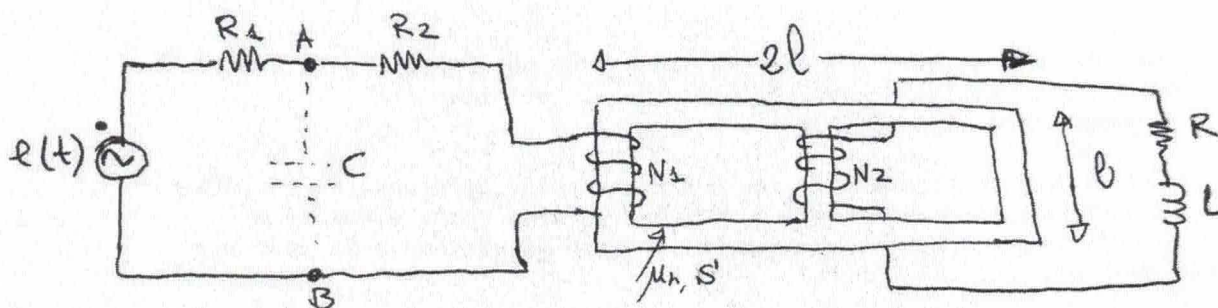
$E_1 = 5V$; $E_2=3V$; $E_3=3V$; $J_1 = 8A$; $J_2 = 4A$; $J_3 = 1A$; $R=2\ \Omega$; $R_1=R_6=1\ \Omega$; $R_2=R_7=2\ \Omega$;
 $R_3=R_8=3\ \Omega$; $R_4=R_9=4\ \Omega$; $R_5=R_{10}=5\ \Omega$; $R_{11}=R_{12}=R_{13}=6\ \Omega$; $L=2mH$



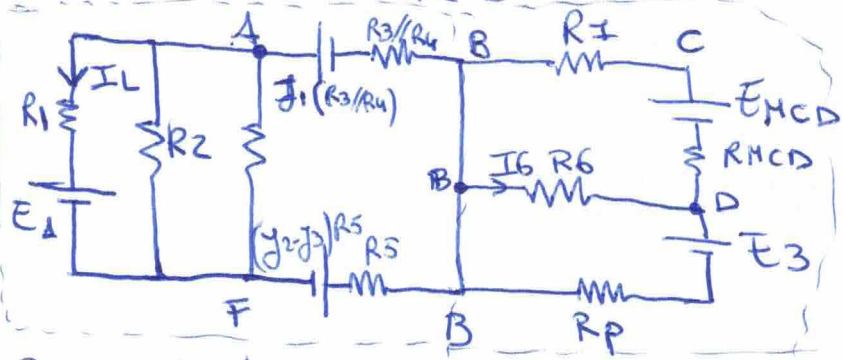
ES.2 – Il sistema si trova a regime. Determinare il valore della capacità C da inserire tra i punti A e B per rifasare totalmente il carico.

$e(t) = 3\sqrt{2} \sin(\omega t)V$; $R_1 = 100\ \Omega$; $R_2 = 10\ \Omega$; $R = 20\ \Omega$; $f = 50Hz$;

$N_1 = 100$; $N_2 = 200$; $l = 2cm$; $S = 5cm^2$; $\mu_r = 1000$; $L=30mH$



- R13 si può trascurare in quanto in // E3 (gen. prevalente)
- Applico Millmann tra C e D
- Faccio parallelo tra R8, R9, R10
- L si compone da c.c
- Millmann tra A e B
- Millmann tra F e B

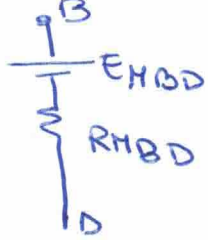
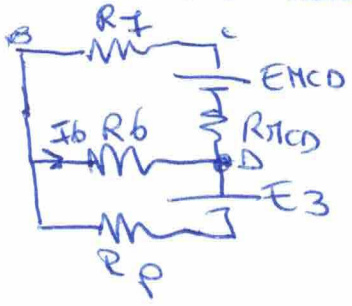


$$R_p = \frac{1}{\frac{1}{R_8} + \frac{1}{R_9} + \frac{1}{R_{10}}}$$

$$E_{MCD} = \frac{E_2}{\frac{1}{R_{12}} + \frac{1}{R_{11}}}$$

$$R_{MCD} = \frac{1}{\frac{1}{R_{12}} + \frac{1}{R_{11}}}$$

Possiamo considerare il circuito di pendenze in due circuiti indipendenti in quanto il caso in comune è caratterizzato dal solo punto B. Quindi considero solo il circuito di pendenze per calcolare la I6:

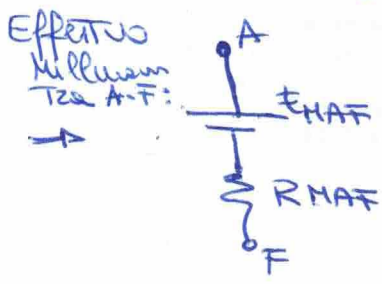
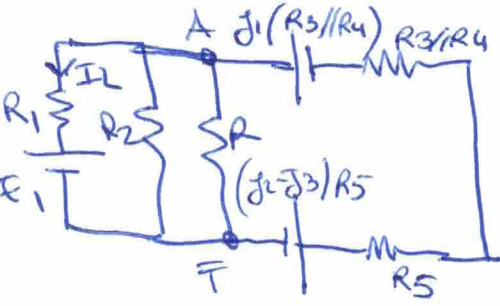


$$E_{MBD} = \frac{+E_{MCD}}{R_{MCD} + R_7} \cdot \frac{E_3}{R_p}$$

$$\frac{1}{R_{MCD} + R_7} + \frac{1}{R_6} + \frac{1}{R_p}$$

$$I_6 = \frac{E_{MBD}}{R_6}$$

Per determinare il valore dell'energia imm. su L mi calcolo le IL:

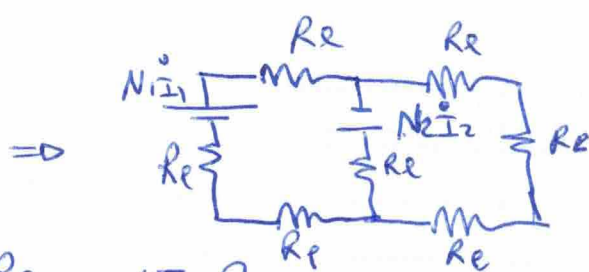
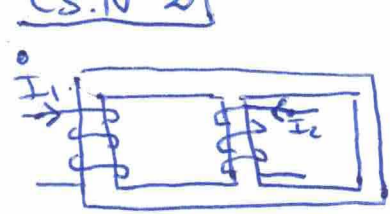


$$E_{MAF} = \frac{E_1 + \frac{I_1(R_3//R_4) - (I_2 - I_3)R_5}{R_5 + (R_3//R_4)}}{\frac{1}{R_2} + \frac{1}{R_1} + \frac{1}{R} + \frac{1}{R_5 + (R_3//R_4)}}$$

$$E_{MAF} = E_1 + R_1 I_L$$

$$I_L = \frac{E_{MAF} - E_1}{R_1}$$

$$W_L = \frac{1}{2} L I_L^2$$



$$R_{eq1} = (3R_e // R_e) + 3R_e = \frac{15}{4} R_e$$

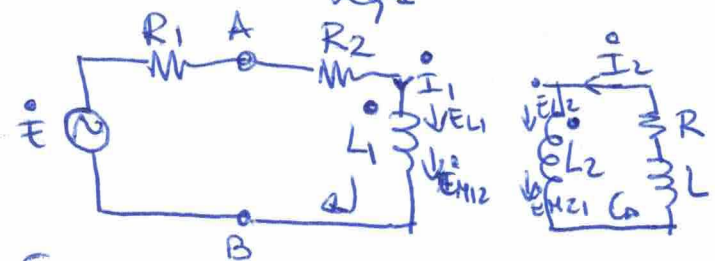
$$R_{eq2} = (3R_e // 3R_e) + R_e = \frac{5}{2} R_e$$

donc: $R_e = \frac{l}{\mu_0 \mu_r S}$

$$L_1 = \frac{N_1^2}{R_{eq1}}$$

$$L_2 = \frac{N_2^2}{R_{eq2}}$$

$$M_{12} = \alpha_{12} \frac{N_1 N_2}{R_{eq1}} > 0 \quad \text{donc: } \alpha_{12} = \frac{3R_e}{3R_e + R_e} = \frac{3}{4}$$



$$\begin{cases} \dot{E} + \dot{E}_{L1} + \dot{E}_{M12} = \dot{I}_1 (R_1 + R_2) \\ \dot{E}_{L2} + \dot{E}_{M21} = \dot{I}_2 (R + j\omega L) \end{cases} \Rightarrow \begin{cases} \dot{E} - j\omega L_2 \dot{I}_1 - j\omega M_{12} \dot{I}_2 = \dot{I}_1 (R_1 + R_2) \\ -j\omega L_2 \dot{I}_2 - j\omega M_{21} \dot{I}_1 = \dot{I}_2 (R + j\omega L) \end{cases} \Rightarrow \dot{I}_1$$

$$\dot{V}_{AB} = \dot{E} - \dot{I}_1 R_1$$

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

$$Q = \omega C |V_{AB}|^2 \Rightarrow C = \frac{Q}{\omega |V_{AB}|^2}$$