COMPITO DI ELETTROTECNICA

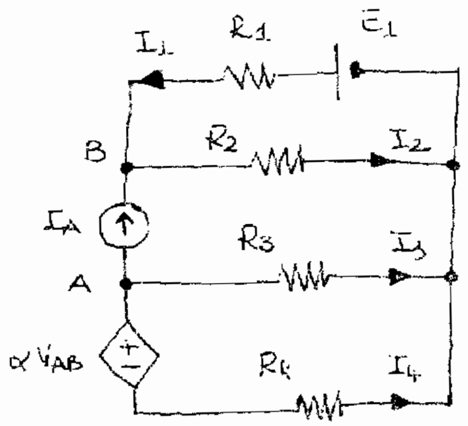
Allievo .... Messina, 27.02.2014

Esercizio 1

Il sistema in figura si trova a regime.

Determinare il valore della tensione V_{AB}, la potenza generata e la potenza erogata da E_1.

E_1=10 V, I_A=2 A, α=2, R_1= R_3=1 Ω, R_2= R_4=5 Ω.



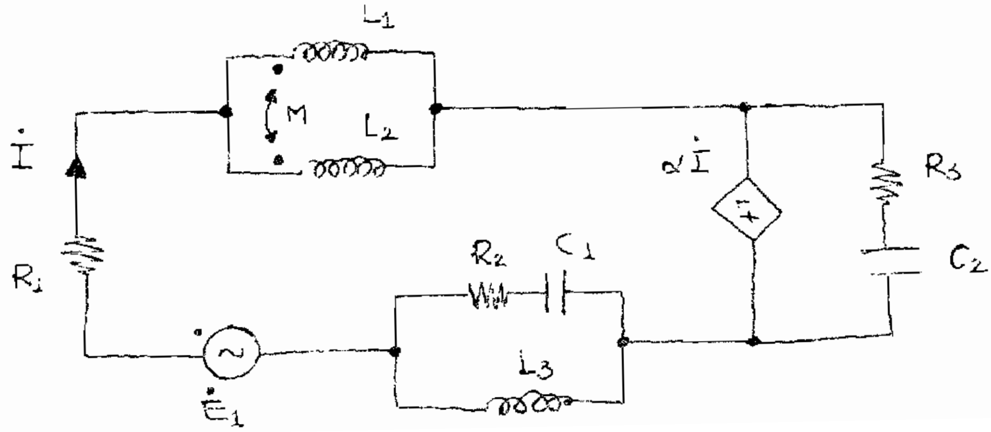
Esercizio 2

Il sistema in figura si trova a regime.

Determinare il valore di $\dot{I}$.

$\dot{E}_1$=1+j1 V, α=2 Ω, R_1= 1 Ω, R_2= 4 Ω, R_3= 2 Ω, C_1= C_2= 1 mF,

L_1= M =2 mH, L_2= L_3= 5 mH.



ESERCIZIO 1

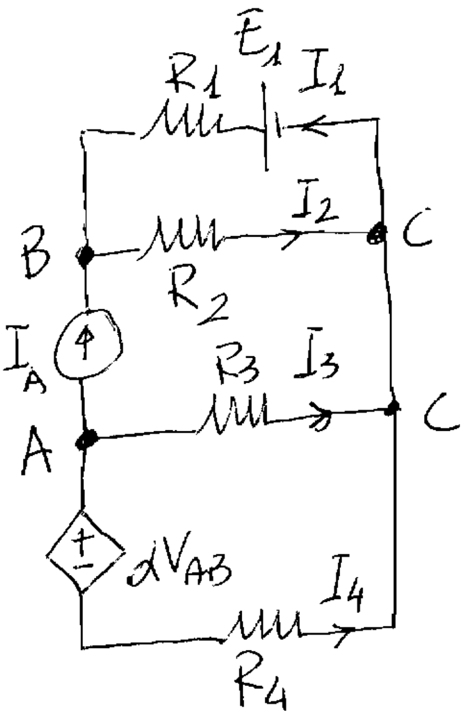


FIG. 1

Millman tra A e C

$$E_{M_{AC}} = \frac{\alpha V_{AB}/R_4}{\frac{1}{R_4} + \frac{1}{R_3}} = \alpha' V_{AB}$$

dove $\alpha' = \dfrac{\alpha/R_4}{\frac{1}{R_4} + \frac{1}{R_3}}$

$$R_{M_{AC}} = \frac{R_3 R_4}{R_3 + R_4}$$

Millman tra B e C

$$E_{M_{BC}} = \frac{E_1/R_1}{\frac{1}{R_1} + \frac{1}{R_2}} \qquad R_{M_{BC}} = \frac{R_1 R_2}{R_1 + R_2}$$

Quindi

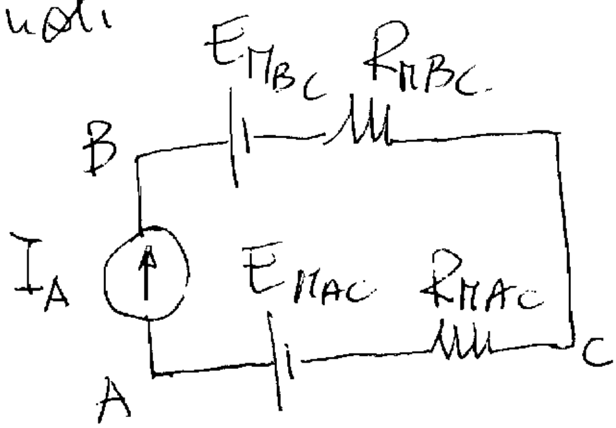


FIG. 2

$$V_{AB} - E_{MAC} + E_{MBC} = -\left(R_{MAC} + R_{MBC}\right) I_A$$

$$V_{AB} - \alpha' V_{AB} + E_{MBC} = -\left(R_{MAC} + R_{MBC}\right) I_A$$

$$V_{AB}\left(1 - \alpha'\right) = -\left(R_{MAC} + R_{MBC}\right) I_A - E_{MBC}$$

$$V_{AB} = -\frac{E_{MBC} + \left(R_{MAC} + R_{MBC}\right) I_A}{1 - \alpha'}$$

da Fig. 1

$$V_{BC} - E_1 = -R_1 I_1 \rightarrow I_1 = \frac{-V_{BC} + E_1}{R_1}$$

da Fig 2

$$V_{BC} - E_{MBC} = R_{MBC} I_A$$

per cui

$$I_1 = \frac{E_{MBC} + R_{MBC} I_A - E_1}{R_1}$$

Quindi

$$P_{g_{E1}} = E_1 I_1 \qquad P_{e_{E1}} = E_1 I_1 - R_1 I_1^2$$

ESERCIZIO 2

L'accoppiamento L_1, L_2, M equivale a una unica induttanza (vedasi appunti) L^*

$$L^* = \frac{L_1 L_2 - M^2}{L_1 + L_2 - 2M}$$

quindi

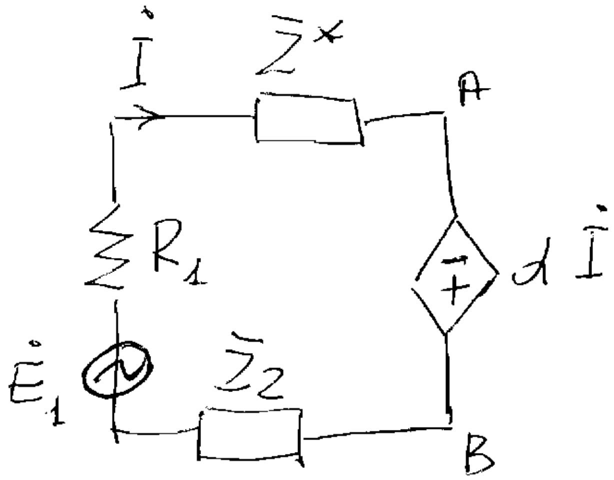
$$\bar{Z}^* = j\omega L^*$$

R_3 e C_2 si possono eliminare perché in parallelo a generatore ideale di tensione

R_2, C_1 ed L_3 in parallelo, quindi

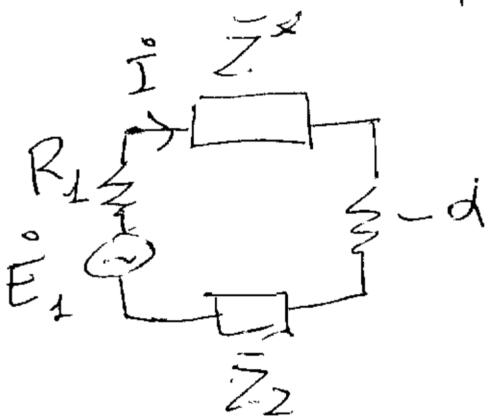
$$\bar{Z}_2 = \frac{(R_2 - j/\omega C_1) \cdot j\omega L_3}{R_2 + j\left(\omega L_3 - \frac{1}{\omega C_1}\right)}$$

Quindi



$$\dot{V}_{AB} + \alpha \dot{I} = 0 \longrightarrow \dot{V}_{AB} = -\alpha \dot{I}$$

quindi Resistenza Equivalente $= \dfrac{\dot{V}_{AB}}{\dot{I}} = -\alpha$



$$\dot{I} = \frac{\dot{E}_1}{R_1 + \bar{Z}^* - \alpha + \bar{Z}_2}$$