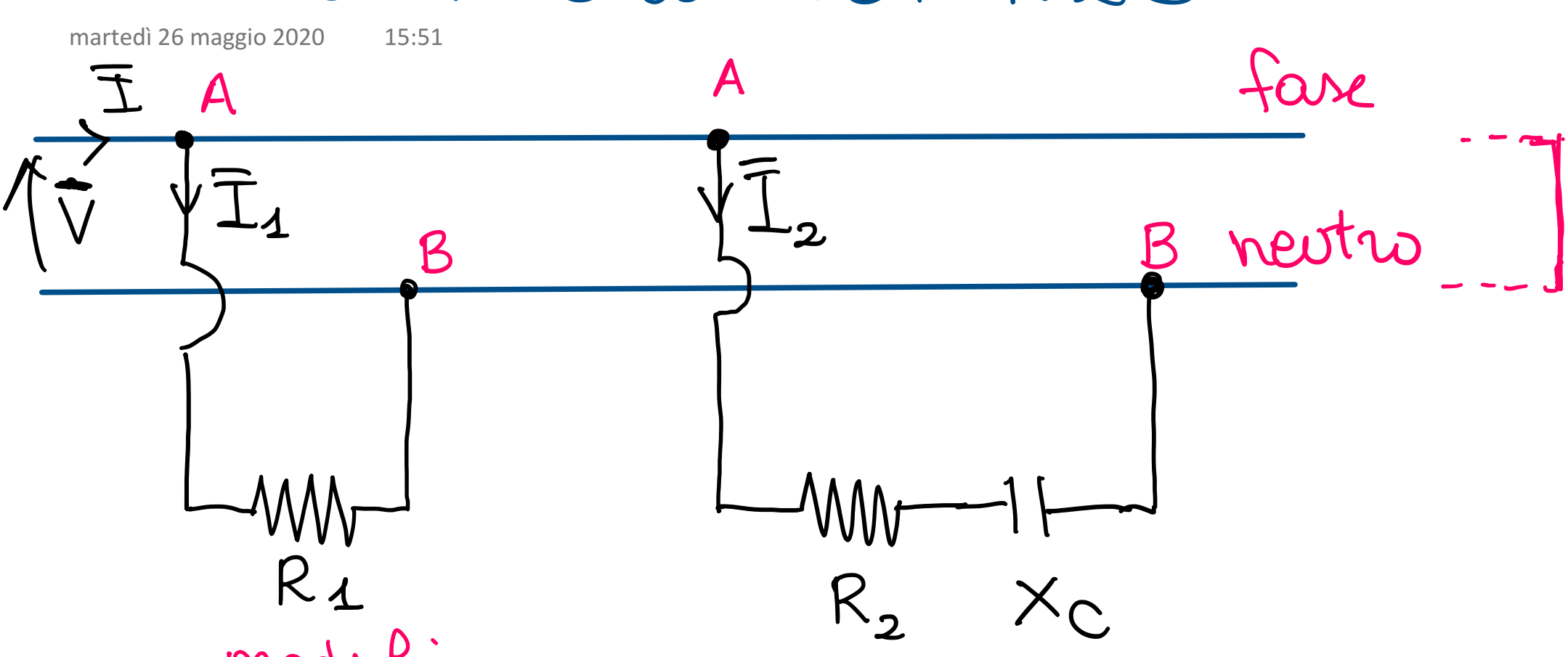
ESERCIZI SULLE POTENZE

martedì 26 maggio 2020 15:51

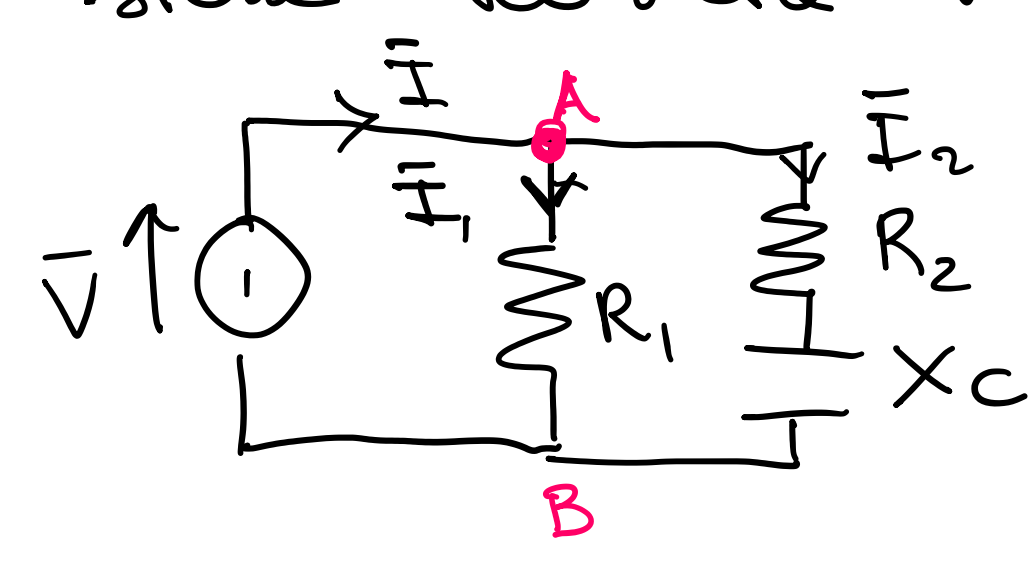


moduli

$V = 230\,V$; $R_1 = R_2 = 10\,\Omega$; $X_C = -10\,\Omega$

Trovare I_1, I_2, $\dot{S}_{TOTALE}$, I.

I 2 carichi sono in parallelo tra i morsetti AB e sono sottoposti alla stessa tensione $\bar{V}$ di cui conosco il valore efficace. (230V)



$\bar{I}_1 = \frac{\bar{V}}{R_1}$ $\quad I_1 = \frac{V}{R_1} = \frac{230}{10} = 23\,A$

$I_2 = \frac{V}{|Z_2|} = \frac{230}{|R_2 + jX_C|} = \frac{230}{|10 - j10|} =$

$= \frac{23}{|1-j|} = \frac{23}{\sqrt{1^2 + 1^2}} = \frac{23}{\sqrt{2}} = 16{,}26\,A$

$\dot{S}_{TOT} = \dot{S}_1 + \dot{S}_2$

$\dot{S}_1 = P_1 + jQ_1 = P_1 = R_1 I_1^2 = 10\,(23)^2 =$
$= 5290$ W

$\dot{S}_2 = \dot{Z}_2 I_2^2 = (R_2 + jX_C) I_2^2 = (10 - j10)(16{,}26)^2 =$
$\simeq 2644 - j2646$ VA

$\dot{S}_{TOT} = S_1 + S_2 = 5290 + 2644 - j2644 =$
$= 7934 - j2644$

P_{TOT} ↑ ↓ $Q_{TOT} < 0$ carico ohmico capacitivo

ATTENZIONE!

~~$I = I_1 + I_2$~~

I_1 e I_2 sono moduli

$\bar{I}_1$ ← → $\bar{I}_2$

$\bar{I}_1 + \bar{I}_2 = 0$

$I_1 + I_2 = 2I_1$

$S_{TOT} = |\dot{S}_{TOT}| = VI$

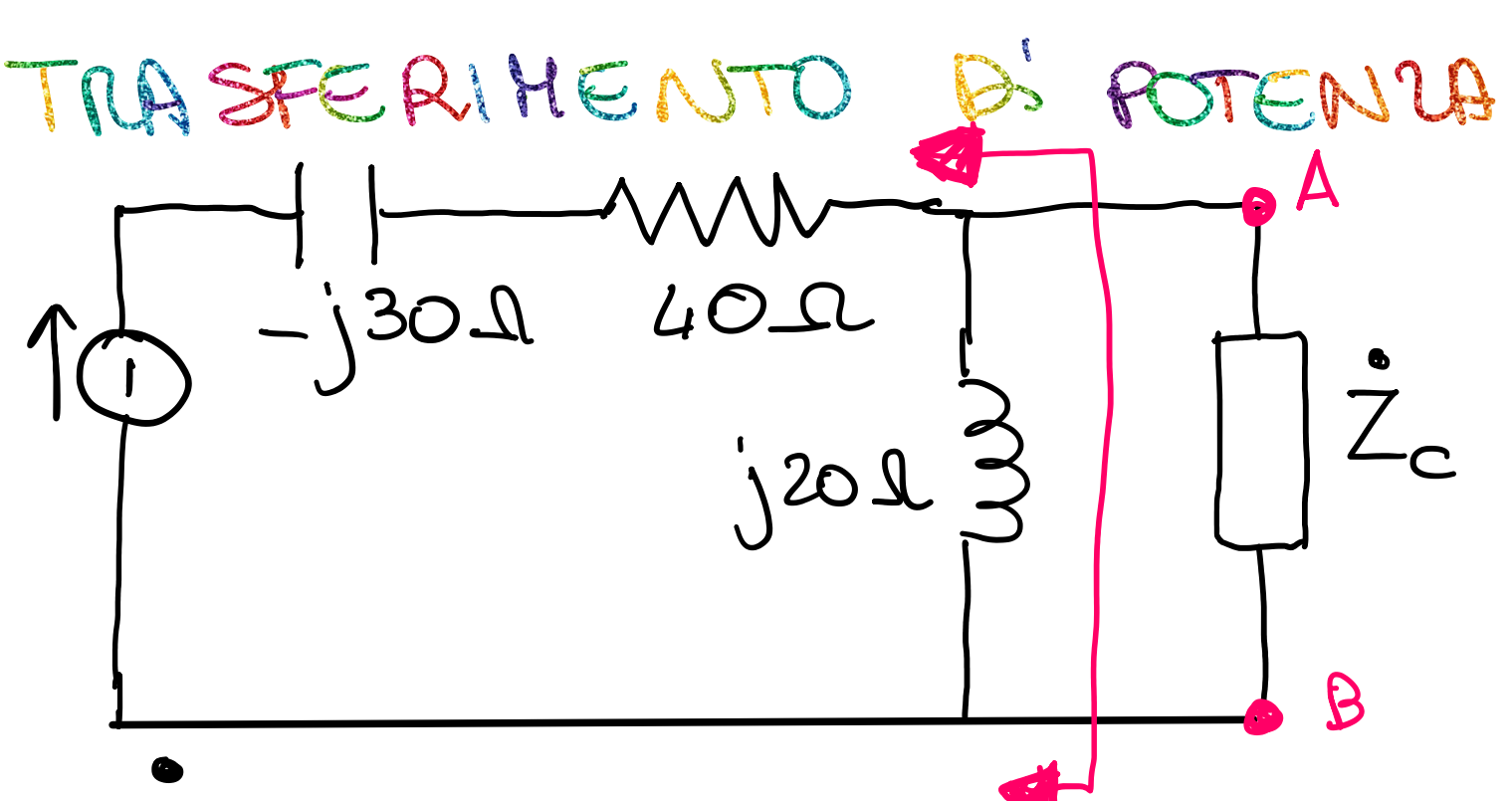
$I = \frac{S_{TOT}}{V}$ → potenza APPARENTE

$S_{TOT} = \sqrt{7934^2 + 2644^2} = 8363\,VA$

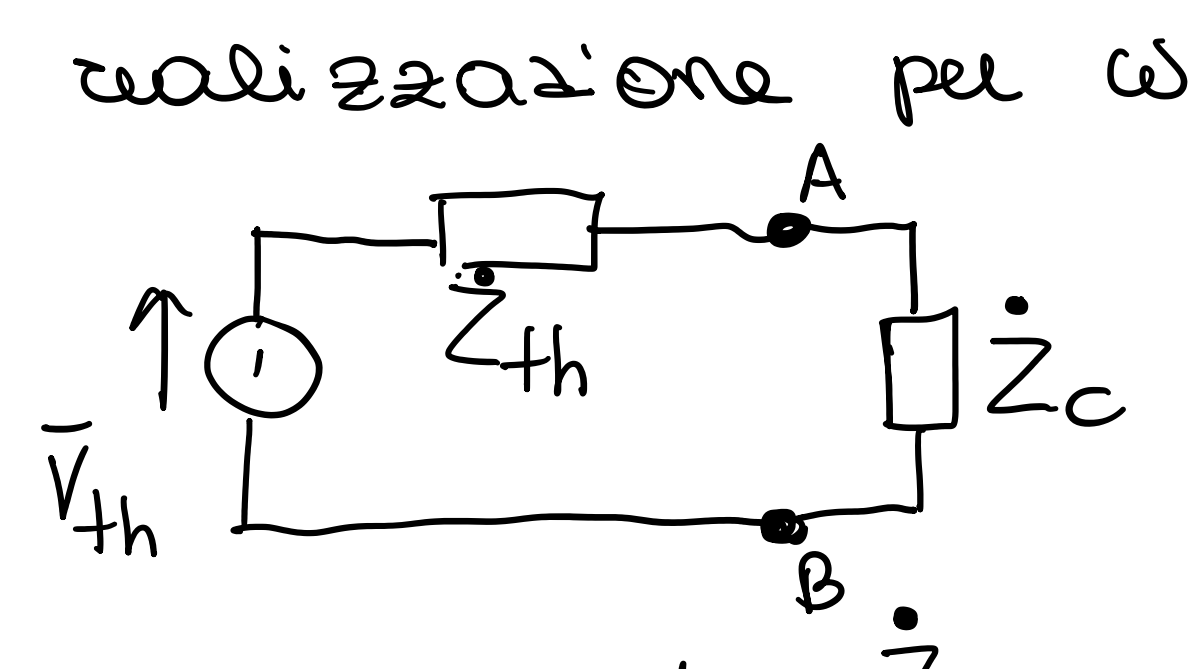
$I = \frac{8363}{230} = 36{,}36\,A$

MASSIMO TRASFERIMENTO DI POTENZA

$150 \angle 30°$

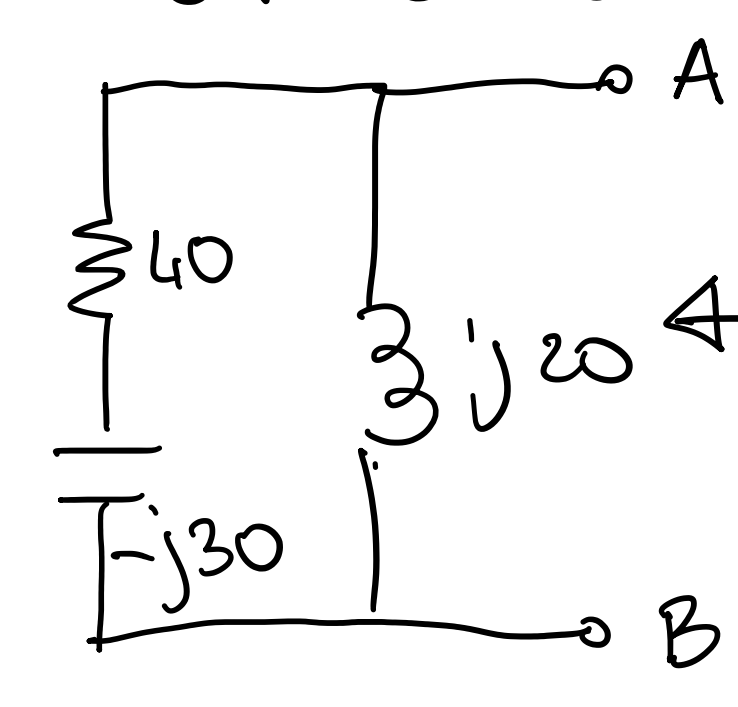


Determinare $\dot{Z}_C$ in modo che assorba la massima potenza media.
Determinare una sua possibile realizzazione per ω = 1 rad/s.



$\dot{Z}_C = \dot{Z}_{th}^*$

Trovare la $\dot{Z}_{th}$: disattivo la rete.



$\dot{Z}_{th} = j20 \,//\, (40 - j30)$

$\dot{Z}_{th} = \frac{j20(40 - j30)}{j20 + 40 - j30} = \frac{j20(4 - j3)}{4 - j} =$

$= \frac{3 + j4}{4 - j} 20 = 20 \frac{(3 + j4)(4 + j)}{(4 - j)(4 + j)} =$

$= 20 \frac{12 + 3j + j16 - 4}{17} = \frac{20}{17}(8 + j19)$

$= 9{,}41 + j22{,}3$

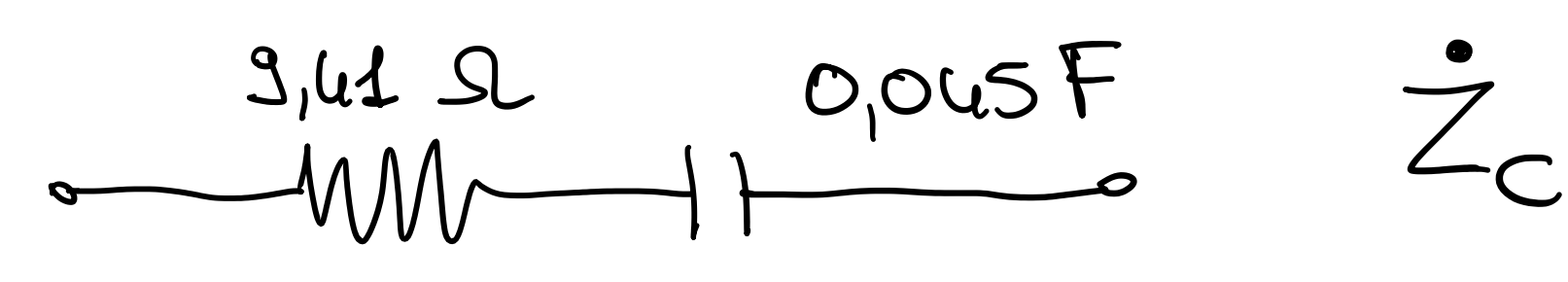
$\dot{Z}_C = \dot{Z}_{th}^* = 9{,}41 - j22{,}3$ (R, X_C)

Realizzazione serie

$R + \frac{1}{j\omega C}$

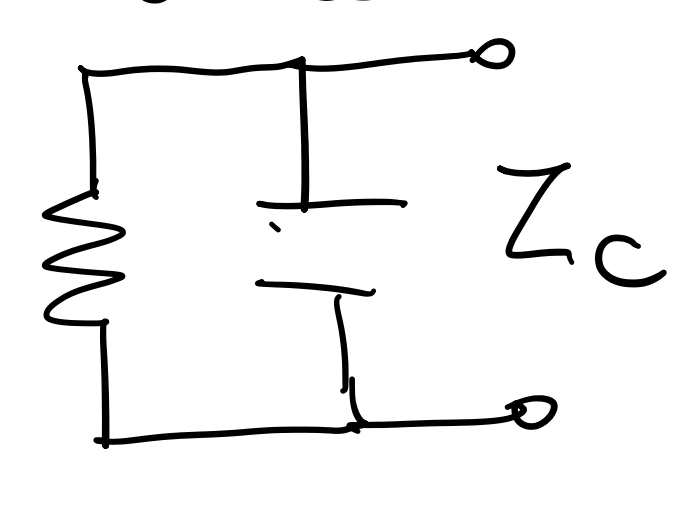
$R = 9{,}41$ $\quad \omega = 1$ rad/s

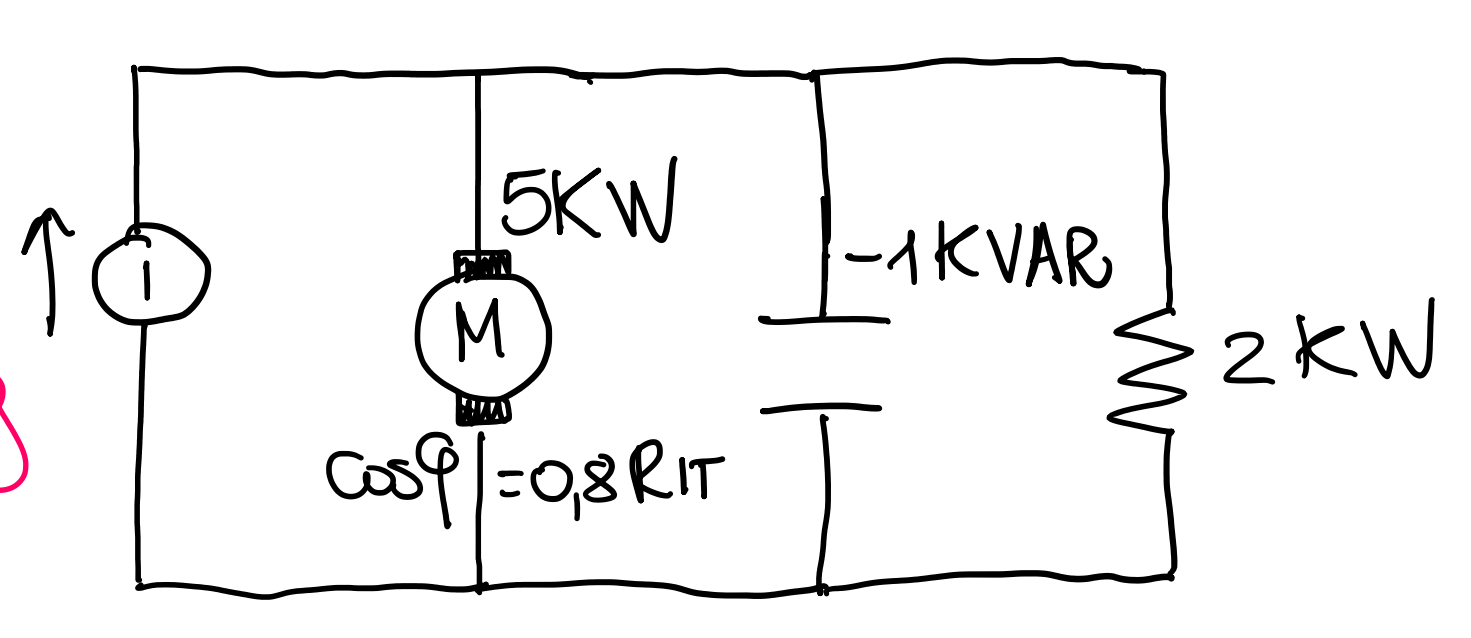
$\frac{1}{C} = 22{,}3$ $\quad C = \frac{1}{22{,}3} = 0{,}045\,F$



Realizzazione parallelo:

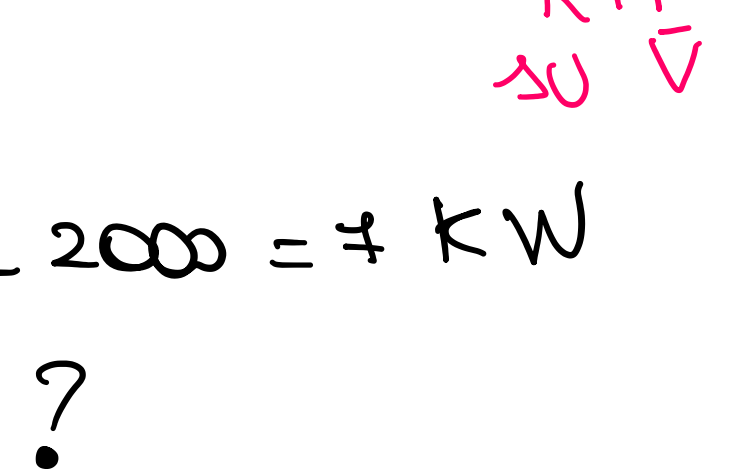
?





Det. la potenza complessa erogata dal generatore e lo sfasamento tra la tensione e la corrente erogata.

(M) Motore $\quad P_M = 5KW$
$\cos\varphi = 0{,}8$ ritardo
↓
carico ohmico induttivo



$\dot{S}_g = P_g + jQ_g$

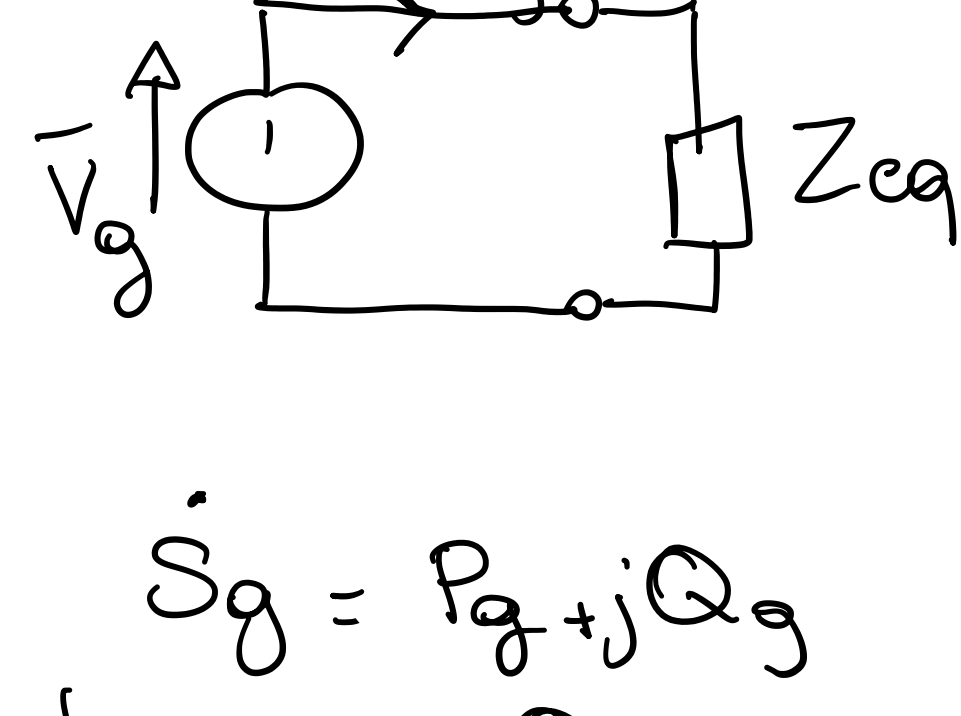
→ $P_g = P_M + P_C + P_R = 5000 + 2000 = 7\,KW$
$P_E \quad \Sigma P_A$

→ $Q_g = Q_M + Q_C + Q_R = \dot{Q}_M - 1000$?

Trovo Q_M, noto P_M e $\cos\varphi$

$Q_M = P_M \, tg\,\varphi \quad \cos\varphi = 0{,}8$
$\varphi = acos\,0{,}8 = 36{,}87° = 0{,}64$ rad
$tg\,\varphi = 0{,}75$
$Q_M = 5000 \cdot 0{,}75 = 3750\,VAR > 0$ OK

$Q_g = Q_M - 1000 = 3750 - 1000 = 2750\,VAR$



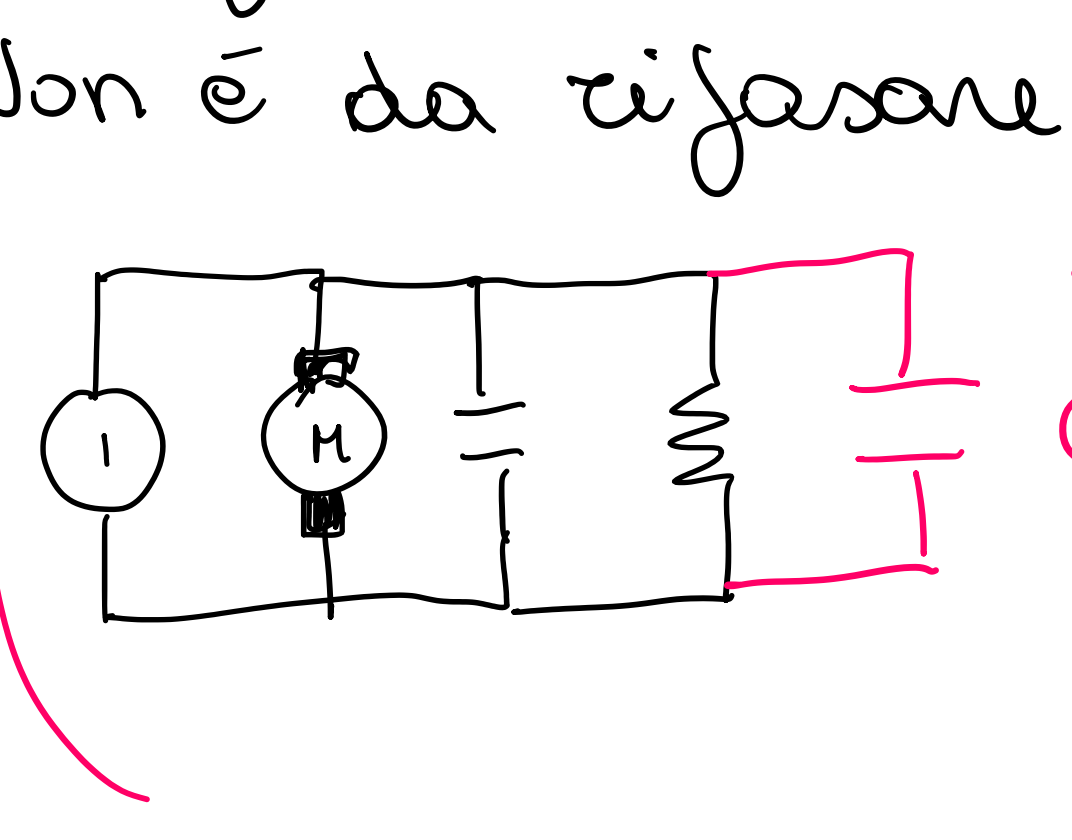
φ_g?
fase di $\dot{Z}_{eq}$
fase di $\dot{S}_g$

$\dot{S}_g = P_g + jQ_g$

$tg\,\varphi_g = \frac{Q_g}{P_g} = \frac{2750}{7000}$

$\varphi_g = atan \frac{2750}{7000} = 0{,}37$ rad

È un carico da rifasare?
Guardo il $\cos\varphi_g$
$\cos\varphi_g = 0{,}93 > 0{,}9$
Non è da rifasare.



Se $\cos\varphi < 0{,}9$
C di rifasamento