$V = IR \quad P = I^2 R$

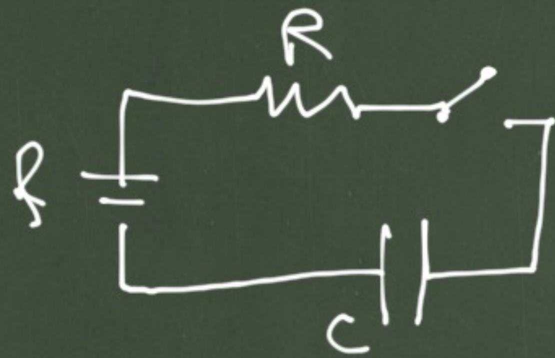
	ser	par
R	$\Sigma_i R_i$	$\frac{1}{R_{eq}} = \Sigma_i \frac{1}{R_i}$
C	$\frac{1}{C_{eq}} = \Sigma_i \frac{1}{C_i}$	$\Sigma_i C_i$

K I $\qquad \sum_k I_k = \emptyset$

K II $\qquad \sum_k \mathcal{E}_k = I R_{eq}$

K II a $\qquad (V_A - V_B) + \sum_k \mathcal{E}_k = I R_{eq}$

Thevenin



$$\mathcal{E} = V_R + V_C = RI + \frac{q'}{C}$$

$$R\frac{dq'}{dt'} = \mathcal{E} - \frac{q'}{C}$$

$$RC\,dq' = (\mathcal{E}C - q')\,dt'$$

$$\int_0^t \frac{dt'}{RC} = \int_0^q \frac{dq'}{(\mathcal{E}C - q')} \rightarrow -\frac{t}{RC} = \log(q' - \mathcal{E}C)\Big|_0^q$$

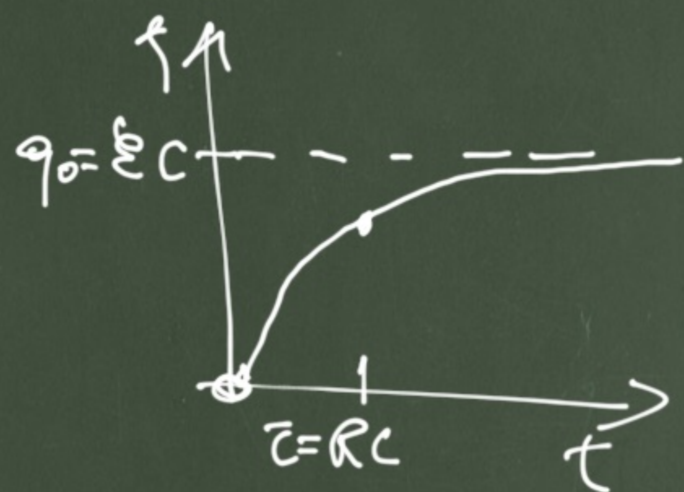
$$= \log\left(\frac{q - \mathcal{E}C}{-\mathcal{E}C}\right) \qquad e^{-t/RC} = \frac{q - \mathcal{E}C}{-\mathcal{E}C}$$

$$e^{-t/RC} = \frac{q-\mathcal{E}C}{-\mathcal{E}C}$$

$$\boxed{q=\mathcal{E}C\left(1-e^{-t/RC}\right)}$$

$t=\emptyset \qquad q=\emptyset$

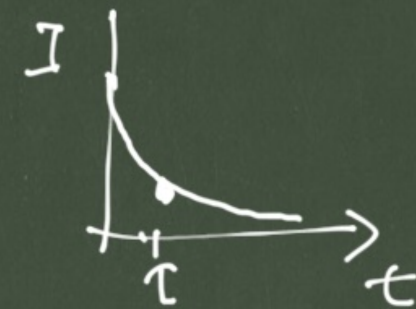
$t\to\infty \qquad q\to\mathcal{E}C$



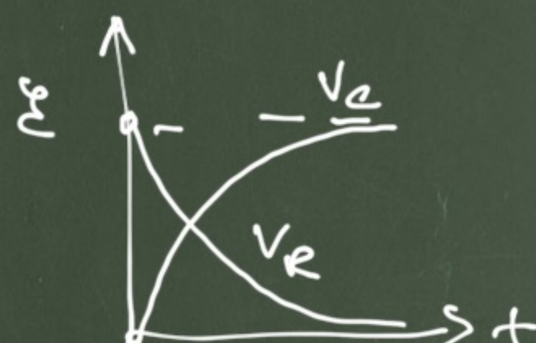
$[RC]=[t]$

$t=RC \to e^{-1}$

$$I = \frac{\mathcal{E}}{R} e^{-t/RC}$$



$$V_C = \mathcal{E} - V_R = \mathcal{E} - \mathcal{E} e^{-t/RC}$$
$$= \mathcal{E}\left(1 - e^{-t/RC}\right)$$



$$P_T = \mathcal{E} I = \frac{\mathcal{E}^2}{R} e^{-t/RC}$$

$$P_R = R I^2 = \frac{\mathcal{E}^2}{R} e^{-2t/RC}$$

$$P_C = V_C I = \frac{\mathcal{E}^2}{R} \left(e^{-t/R} - e^{-2t/RC} \right)$$

$$W = \int_0^\infty dt \, P = \frac{\mathcal{E}^2}{R} \int_0^\infty e^{-t/RC} = -RC \frac{\mathcal{E}^2}{R} e^{-t/RC} \Big|_0^\infty$$

$$= \mathcal{E}^2 C$$

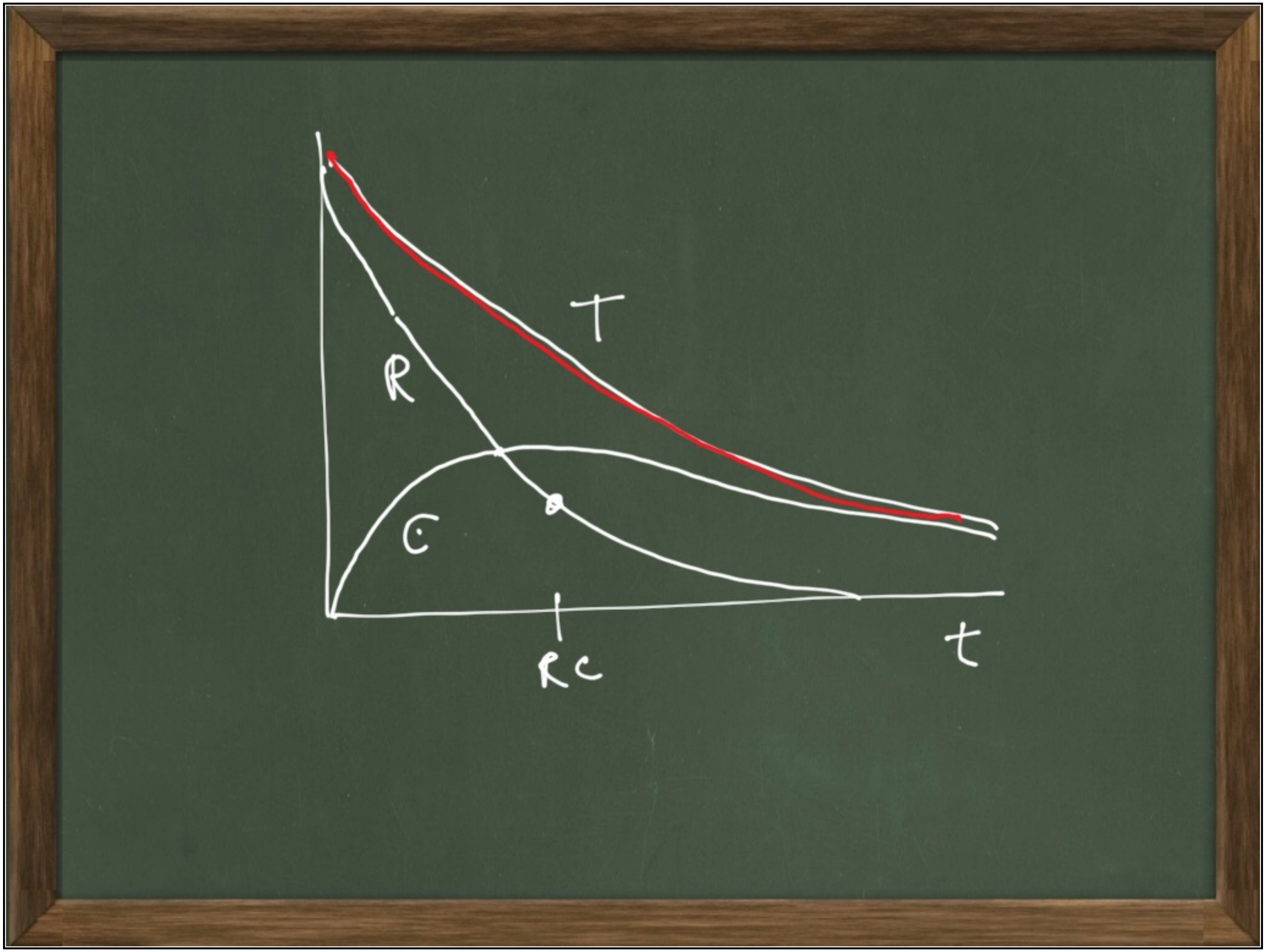
$$W = W_R + W_C \qquad W = \mathcal{E}^2 C$$

$$W_R = \int_0^\infty dt\, P = \frac{\mathcal{E}^2}{R}\int_0^\infty dt\, e^{-2t/RC} = -\frac{RC}{2}\frac{\mathcal{E}^2}{R}\, e^{-2t/RC}\Big|_0^\infty$$

$$= \frac{\mathcal{E}^2 C}{2}$$

$$W_C = \frac{\mathcal{E}^2 C}{2} = W - W_R$$

CARICA


T
R
C
RC
t

$$\mathcal{E} = 0 = RI + \frac{q'}{C}$$

$$R\frac{dq'}{dt'} = -\frac{q'}{C}$$

$$\int_0^t \frac{dt'}{RC} = -\int_{q_0}^{q} \frac{dq'}{q'} \Rightarrow -\frac{t}{RC} = \lg q' \Big|_{q_0}^{q} = \lg \frac{q}{q_0}$$

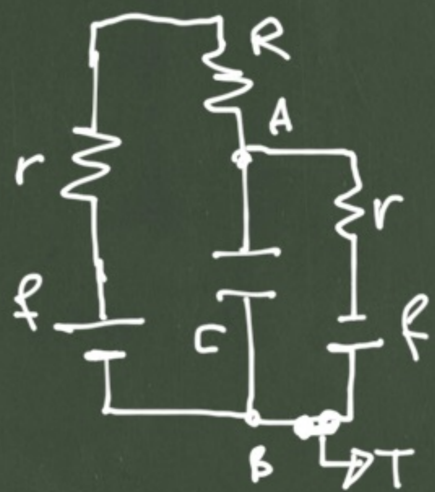
$$\boxed{q_0 e^{-t/RC} = q}$$

$$V_c = \frac{q}{C} = \frac{q_0}{C} e^{-t/RC} = V_0 e^{-t/RC}$$

$$I = \frac{q_0}{RC} e^{-t/RC}$$

$$P = R I^2 = \frac{V_0^2}{R} e^{-2t/RC}$$

$$W_{sc} = \int_0^{\infty} \frac{V_0^2}{R} e^{-2t/RC} = \frac{RC}{2} \frac{V_0^2}{R} = \frac{V_0^2 C}{2}$$



$$2f = (R+2r)\, I$$

$$V_A - V_B = I r - f = \frac{2fr}{(R+2r)} - f$$

$$= -f \frac{R}{2r+R}$$

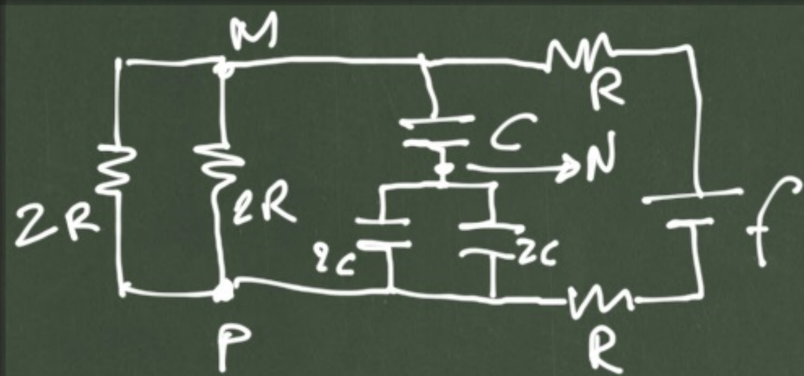
$$Q_0 = -\frac{fRC}{2r+R}$$

inizio

"fine" $(V_A - V_B) = f$

$$Q = Cf$$

$$\Delta Q = Cf\left(1 - \frac{R}{(2r+R)}\right)$$



$$I = \frac{f}{3R}$$

$$V_M - V_{\cancel{B}} = I R_{\parallel} = \frac{f}{3}$$

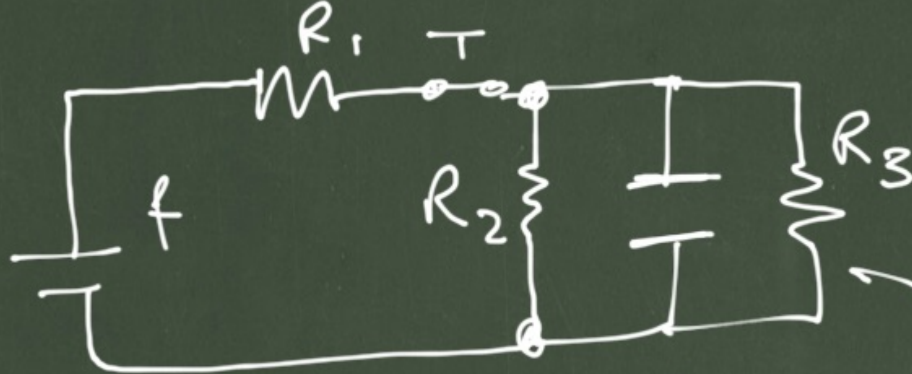
$$\frac{2R \cdot 2R}{4R} = R = R_{\parallel}$$

$$C_{\parallel} = 4C$$

$$1/C_{ser} = \frac{1}{c} + \frac{1}{4c} = \frac{5}{4c} ; C_{ser} = \frac{4c}{5}$$

$$Q = \text{"}CV\text{"} = \frac{4C}{5}\,\frac{f}{3} = \frac{4}{15} c f$$

$$V_N - V_P = \frac{4}{15} cf \, \frac{1}{4c} = \frac{f}{15}$$

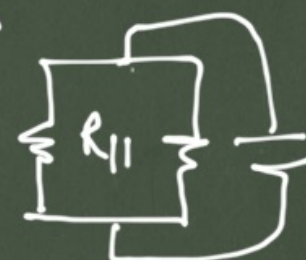


inizio

$$R_{\parallel} = \frac{R_2 R_3}{R_2 + R_3}$$

$$f = I_0 (R_1 + R_{\parallel})$$

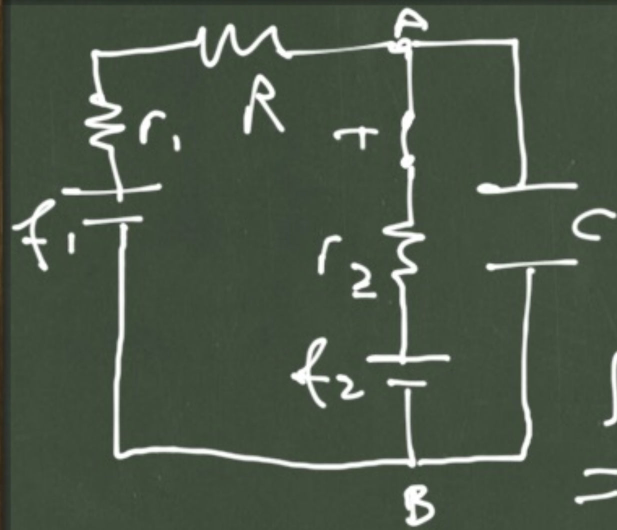
$$V_0 = I_0 R_{\parallel} = \frac{R_{\parallel}}{R_1 + R_{\parallel}} f$$



$t > 0$ T open

$$V = V_0 e^{-t/R_{\parallel} C}$$

$$I_2 = \frac{V}{R_2} = \frac{V_0 e^{-t/R_{\parallel} C}}{R_2} = \frac{R_{\parallel}}{R_1 + R_{\parallel}} \frac{f e^{-t/C R_{\parallel}}}{R_2}$$



$$f_1 - f_2 = I_0(r_1 + r_2 + R)$$

$$V_A - V_B = \frac{r_2(f_1 - f_2)}{r_1 + r_2 + R} + f_2$$

$$= \frac{r_2(f_1 - \cancel{f_2}) + r_1 f_2 + \cancel{r_2 f_2} + R f_2}{r_1 + r_2 + R}$$

$$V_0 = \frac{f_2(r_1 + R) + f_1 r_2}{r_1 + r_2 + R}$$

$$Q_0 = C V_0$$

$$Q = f_1 C - A e^{-t/(r_1+R)C}$$

$$-A = Q_0 - f_1 C$$

$$\tau = (R + r_1) c$$

$$Q = f_1 c - A e^{-t/(r_1+R)c} \qquad -A = Q_0 - f_1 c$$

$$= f_1 c + (Q_0 - f_1 c) e^{-t/\tau}$$

$$= f_1 c + \left(\frac{f_2 (R + r_1) + f_1 r_2}{r_1 + r_2 + R} - f_1 c \right) e^{-t/\tau}$$

$$\vdots$$

$$= f_1 c \left(1 - \frac{(f_1 - f_2)(R + r_1)}{(R + r_1 + r_2) f_1} e^{-t/\tau} \right)$$