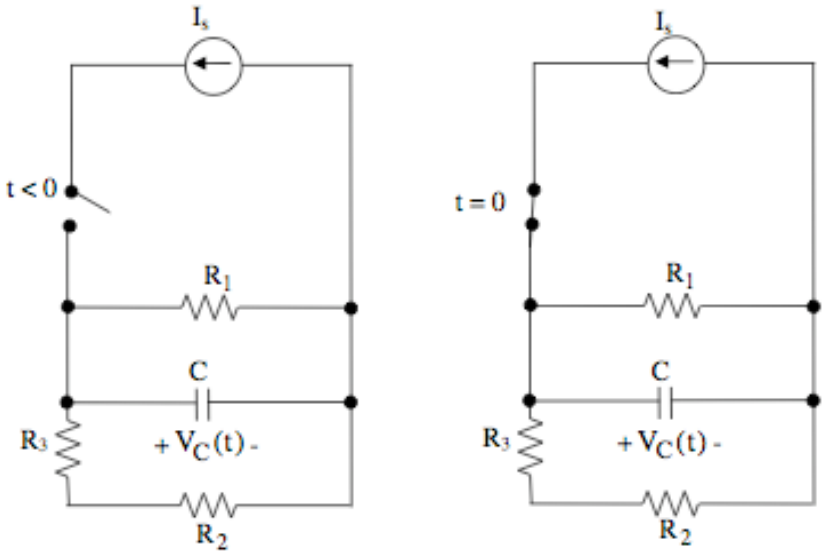
Ex:

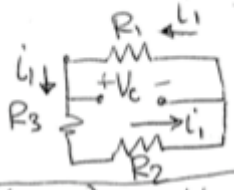


After being open for a long time, the switch closes at $t = 0$. Write an expression for $v_C(t > 0)$ in terms of at most circuit quantities R_1, R_2, R_3, i_s, and C.

Sol'n:

$R_1 \| (R_2+R_3) = \dfrac{R_1(R_2+R_3)}{(R_1+R_2+R_3)}$

$(t=0^-)$ cap acts as an open. switch open.



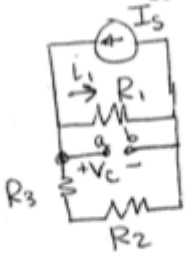
only 1 current $\Rightarrow +i_1(R_1+R_2+R_3)=0$

$\therefore i_1 = 0$

$V_c = 0$

$V_c(t=0^-) = V_c(t=0^+) = 0$

$(t \to \infty)$ cap acts as an open. switch closed.



current divider:

$i_1 = \dfrac{I_s(R_2+R_3)}{(R_1+R_2+R_3)}$ $\quad \therefore V_c = i_1 R_1 = \dfrac{I_s R_1(R_2+R_3)}{R_1+R_2+R_3}$

$\tau = R_{eq} \cdot C = R_1 \| (R_2+R_3) \cdot C$

$t>0$

$$V_c(t) = \frac{I_s R_1(R_2+R_3)}{R_1+R_2+R_3} - \frac{I_s R_1(R_2+R_3)}{R_1+R_2+R_3} \cdot e^{-t/[R_1\|(R_2+R_3)]C} \text{ V}$$