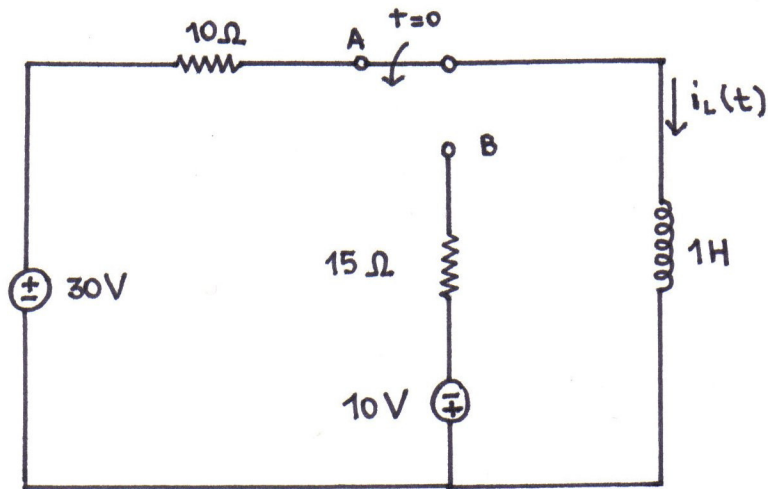


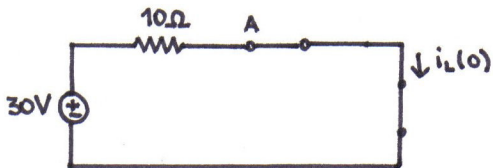
PROBLEM 1



The switch has been in position A for a long time and it is moved to position B at $t=0$

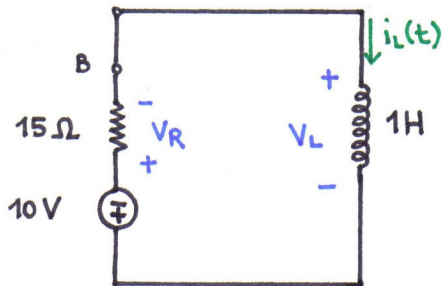
Find $i_L(t)$ for $t \geq 0$.

$t < 0$



$$i_L(0) = \frac{30V}{10\Omega} = 3A$$

$t \geq 0$



$$\text{KVL} \quad V_L + V_R + 10 = 0$$

$$1. \frac{di_L}{dt} + 15i_L = -10$$

$$\frac{di_L}{dt} + 15i_L = -10$$

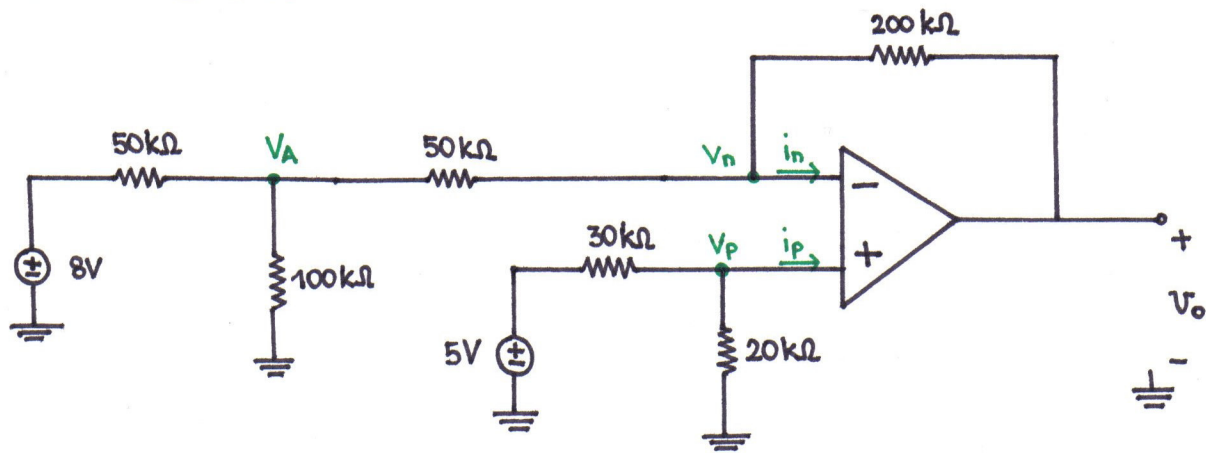
$$i_L(t) = A e^{-15t} + B$$

$$B = -\frac{10}{15} = -\frac{2}{3}$$

$$A = i_L(0) - B = 3 + \frac{2}{3} = \frac{11}{3}$$

$$i_L(t) = \frac{11}{3} e^{-15t} - \frac{2}{3} A \quad t \geq 0$$

PROBLEM 2



Determine V_o

$$i_p = 0 \quad \Rightarrow \quad V_p = \frac{20K}{20K + 30K} \cdot 5V = 2V$$

$$V_n = V_p \quad \Rightarrow \quad V_n = 2V$$

$$\text{KCL @ NODE A} \quad \frac{V_A - 8}{50K} + \frac{V_A}{100K} + \frac{V_A - 2}{50K} = 0$$

$$2V_A - 16 + V_A + 2V_A - 4 = 0$$

$$V_A = \frac{20}{5} = 4V$$

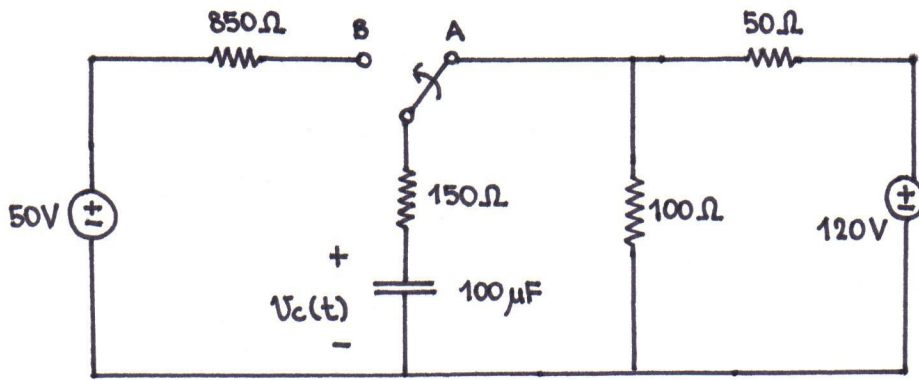
$$\text{KCL @ NODE N} \quad i_n = 0 \quad \Rightarrow \quad \frac{V_n - V_A}{50K} + \frac{V_n - V_o}{200K} = 0$$

$$4(2 - 4) + (2 - V_o) = 0$$

$$-8 + 2 - V_o = 0$$

$$V_o = -6V$$

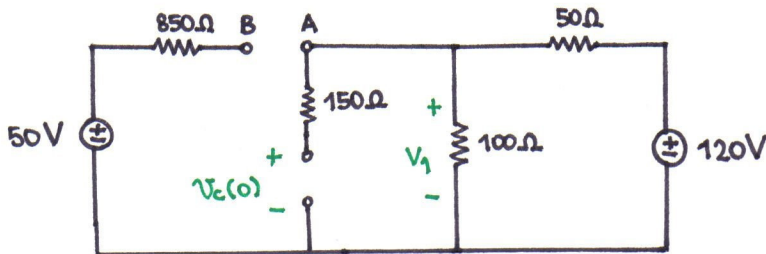
PROBLEM 3



The switch has been in position A for a long time and it is moved to position B at $t = 0$.

Find $v_c(t)$ for $t \geq 0$

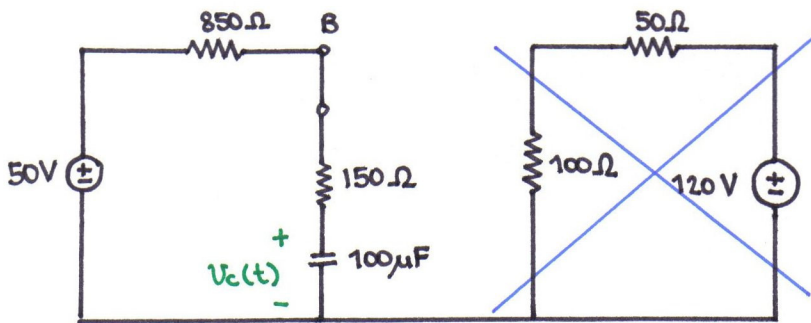
$t < 0$



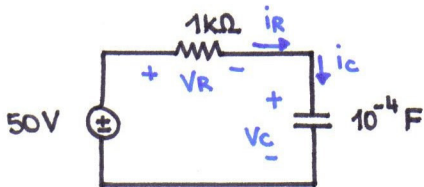
$$v_c(0) = v_1$$

$$= \frac{100}{100 + 50} \cdot 120 = 80V$$

$t \geq 0$



YOU CAN IGNORE THIS PART OF THE CIRCUIT BECAUSE IT DOES NOT AFFECT $v_c(t)$



$$i_R = i_C \Rightarrow \frac{50 - v_C}{10^3} = 10^{-4} \frac{dv_C}{dt}$$

$$\frac{dv_C}{dt} + 10v_C = 500$$

$$v_C(t) = A e^{-10t} + B$$

$$B = \frac{500}{10} = 50$$

$$A = v_C(0) - B = 80 - 50 = 30$$

$$v_C(t) = 30 e^{-10t} + 50 \text{ V}$$

$t \geq 0$