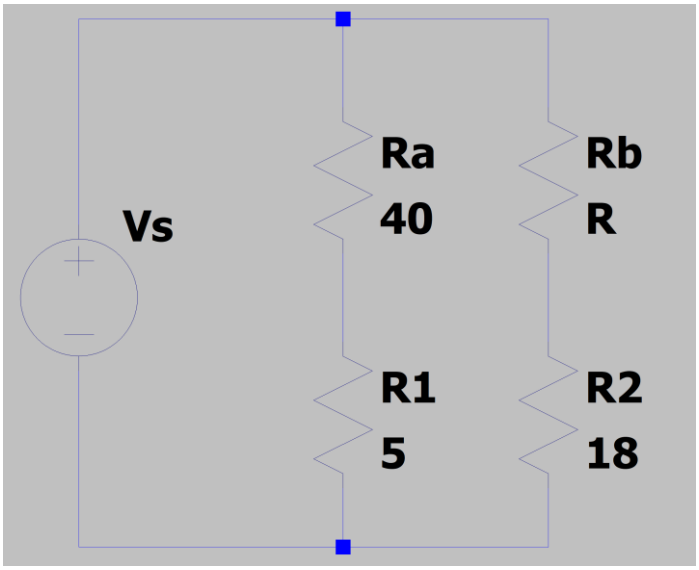
Q1. $R_1 = 5\Omega,\ R_2 = 18\Omega, R_a = 40\Omega, Find\ resistance\ R_b\ When\ (V_1 - V_2) = 0.$



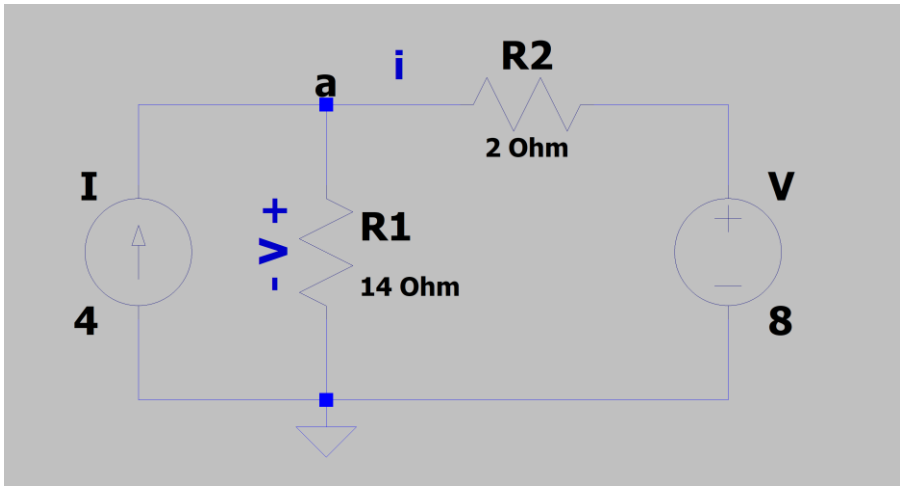
$$V_1 = V_2$$

$$V_s \times \frac{R_1}{R_a + R_1} = V_s \times \frac{R_2}{R_b + R_2}$$

$$R_b = \frac{R_2(R_a + R_1)}{R_1} - R_2$$

$$R_b = \frac{18(40 + 5)}{5} - 18 = 144\Omega$$

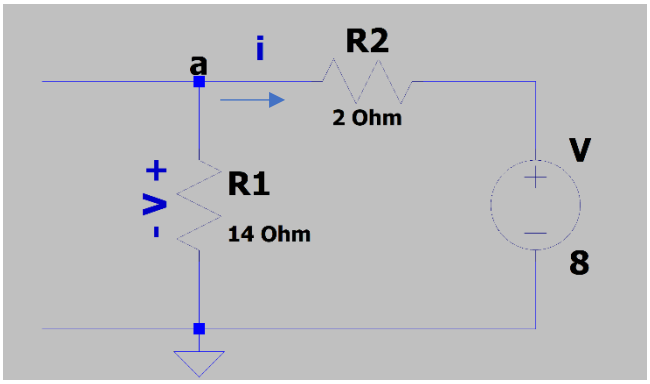
Q2. *Find* i (along 2Ω) *and* v(across 14Ω).



Apply superposition

$$i_1 = \frac{-V}{R_1 + R_2} = \frac{-8}{14 + 2} = -0.5\ A$$

$$V_1 = V \times \frac{R_1}{R_1 + R_2} = 8 \cdot \frac{14}{16} = 7V$$

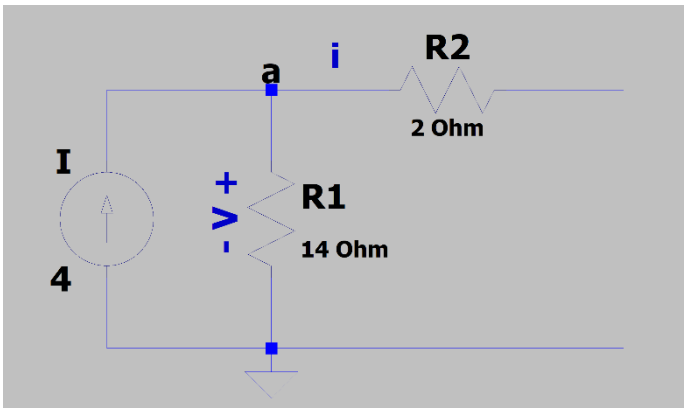


$$V_2 = I \times (R_1 || R_2) = 4 \cdot 1.75 = 7V$$

$$I_2 = \frac{V_2}{R_2} = \frac{7}{2} = 3.5A$$

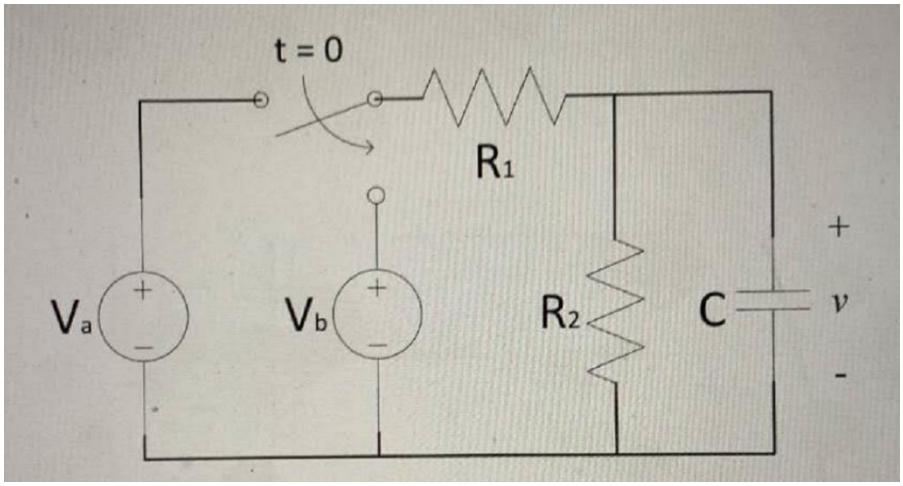
$$i = 3.5 - 0.5 = 3A$$

$$v = 7 + 7 = 14V$$



Q3

$V_a = 12V, V_b = -20V, R_1 = 4k\Omega R_2 = 12k\Omega, C = 100\mu F. Find\ v(t)\ for\ t > 0$



$Find\ v_c(0^+),\ \ v_c(\infty)$

$$v_c(0^+) = v_c(0^-) = V_a \times \frac{R_2}{R_1 + R_2} = 12 \cdot \frac{12}{16} = 9V$$

$$v_c(\infty) = V_b \times \frac{R_2}{R_1 + R_2} = -20 \cdot \frac{12}{16} = -15V$$

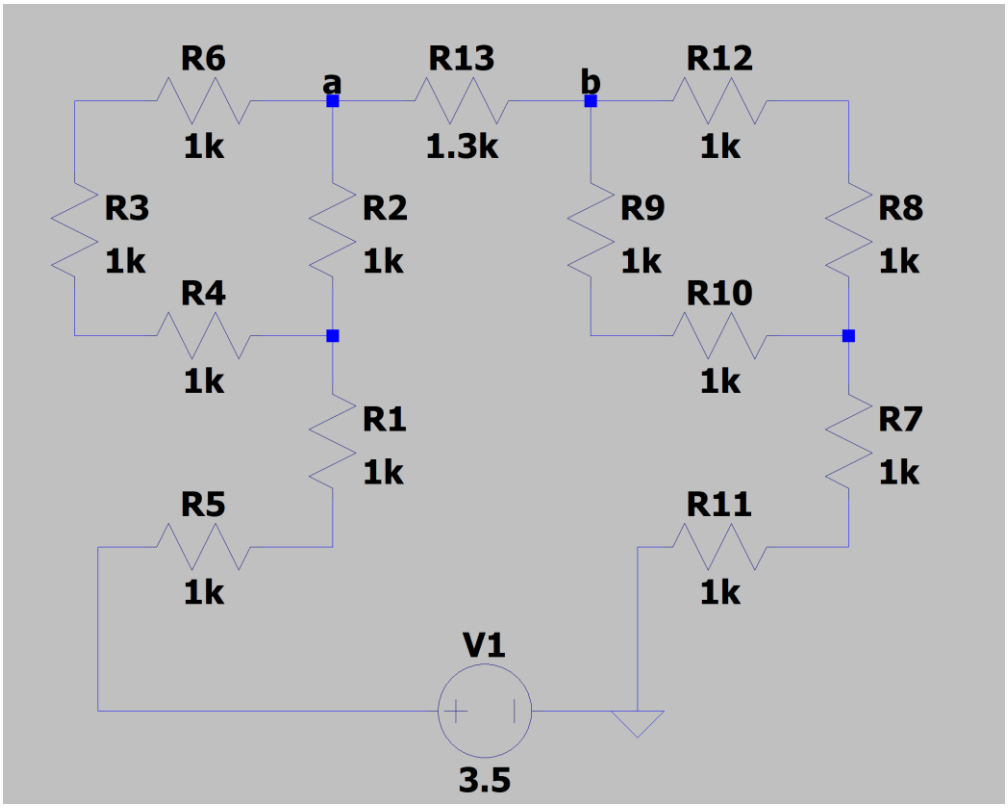
This is case B

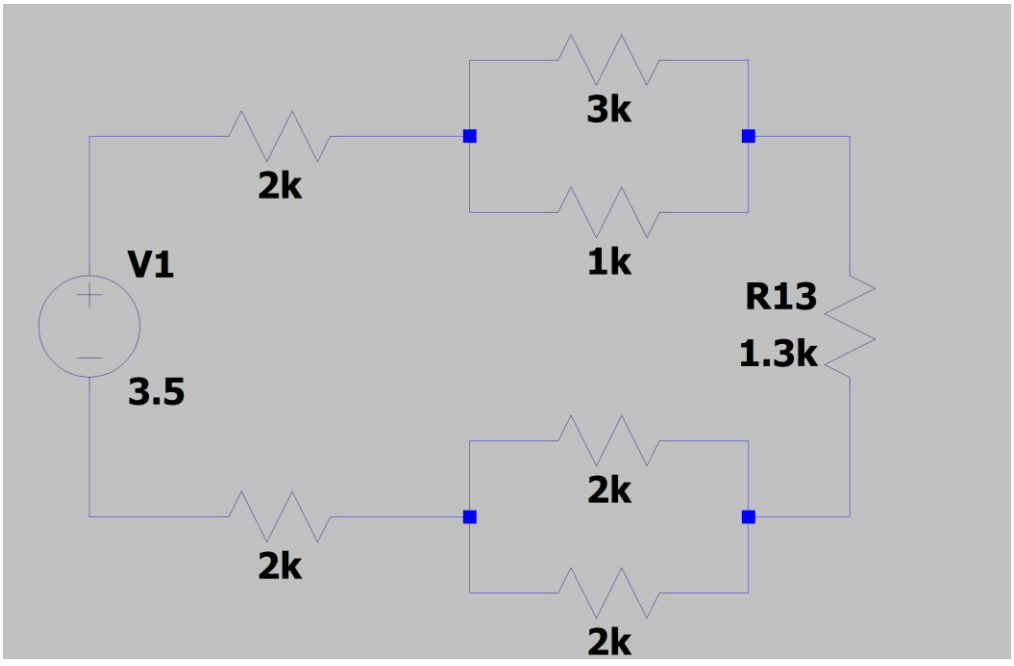
$$v(t) = v_c(\infty) + [v_c(0^+) - v_c(\infty)]e^{-\frac{t}{RC}}$$

$$v(t) = -15 + 24e^{-\frac{t}{0.3}}$$

Q4

$Find\ V_{ab}(across\ R13)$





$$V_{ab} = V \times \frac{R_{13}}{R_{13} + 2k + 3k||1K + 2k||2k + 2k} = 0.645V$$

Q5

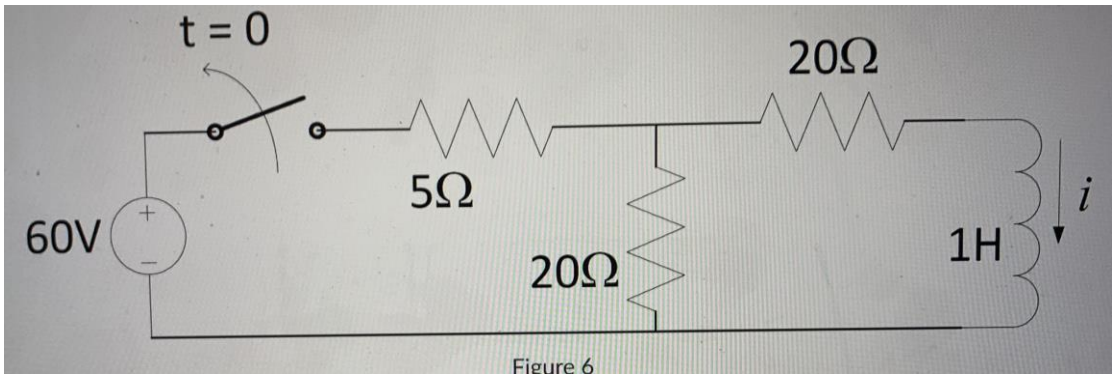


Figure 6

a. Find i(t).

b. Find t when i(t) drop to one-third of its initial value.

Q6 Find $i(0^+)$ and $i(\infty)$

$i(0^+) = i(0^-) = \left(\frac{20}{20+20}\right) \cdot V/R_{eq}$

$= \frac{1}{2} \cdot 60 / (10+5) = 2A$

$i(\infty) = 0$

current drop → case B

(a) $i_L(t) = i(\infty) + [i(0^+) - i(\infty)]\, e^{-\frac{t}{\tau}}$

$= 0 + 2\, e^{-t/0.025}$ $\left(\frac{R}{L} = \frac{20+20}{1} = 40 = \frac{1}{0.025}\right)$

(b) $i_L(0) = 2$,

$i_L(t) = \frac{2}{3} = 2e^{-t/0.025}$

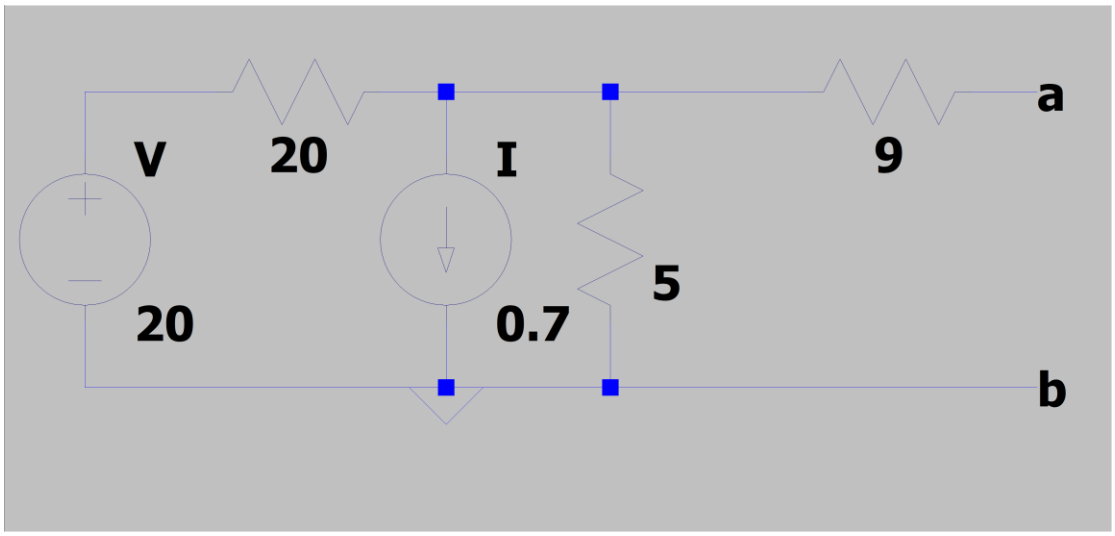
$\ln\left(\frac{2}{6}\right) = -\frac{t}{0.025}$

$t = -0.025\,[\ln(\frac{1}{3})]$

$t = 0.02747\ s = 27.47\ ms$

Q8

Find Norton current of ab



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Q8 $R_{Th} = R_{NT} = R_0 + 5 \| 20 = 13\,\Omega$

(V) only, $V_1 = V \times \frac{5}{20+5} = 20 \times \frac{1}{5} = 4\,V$

(A) only, $V_2 = \cdot I \times 5 \| 20 = -0.7 \times 4 = 2.8\,V$

$V_{ab} = V_1 + V_2 = 4 - 2.8 = 1.2\,V$

$I_{ab} = \frac{V_{ab}}{R_{TH}} = 0.0923\,A.$