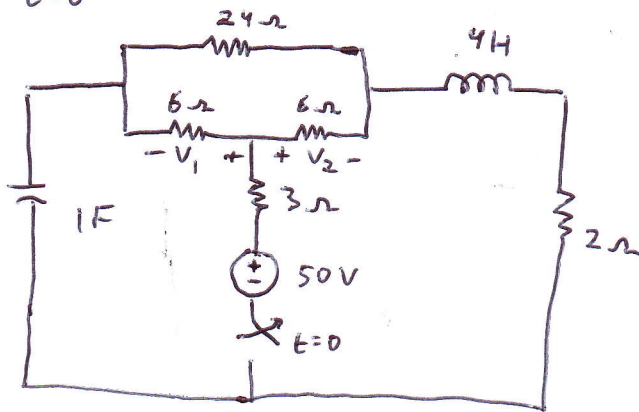


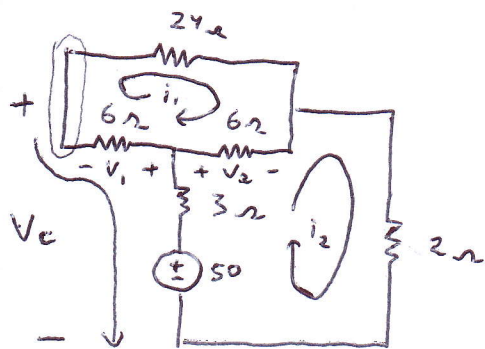
# Latihan soal.

1) Rangkaian steady state saat  $t=0^-$ .

Tentukan  $V_1, V_2$  saat  $t=0^-$  dan  $t=0^+$



Rangk. saat  $t=0^-$



Loop  $i_1$ :

$$6i_1 + 24i_1 + 6(i_1 - i_2) = 0$$

$$36i_1 - 6i_2 = 0$$

$$6i_1 - i_2 = 0 \dots (1)$$

Loop  $i_2$ :

$$2i_2 - 50 + 3i_2 + 6(i_2 - i_1) = 0$$

$$-6i_1 + 11i_2 = 50 \dots (2)$$

$$(1) \& (2): 6i_1 - i_2 = 0$$

$$\frac{-6i_1 + 11i_2 = 50}{+}$$

$$10i_2 = 50$$

$$i_2 = 5A$$

$$i_1 = \frac{5}{6}A$$

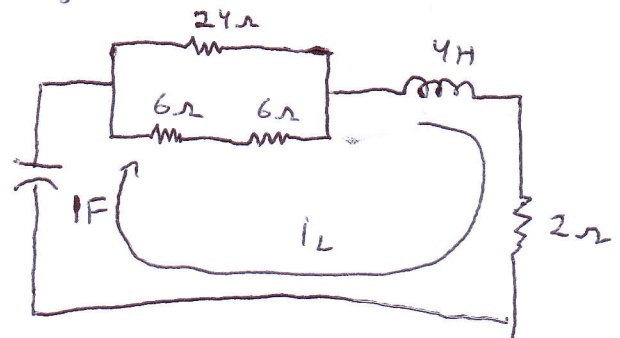
$$i_L = i_2 = 5A$$

$$V_c = 6\left(-\frac{5}{6}\right) + 3(-5) + 50 = 30V$$

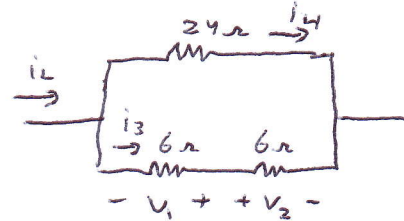
$$V_1(0^-) = 6 \cdot \frac{5}{6} = 5V$$

$$V_2(0^-) = 6 \cdot \left(5 - \frac{5}{6}\right) = 25V$$

Rangk. saat  $t=0^+$



$$i_L(0^+) = i_L(0^-) = 5A$$

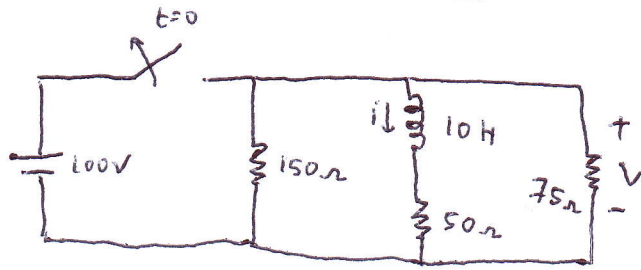


$$i_3 = \frac{24}{24+6+6} \times i_L = \frac{24}{36} \cdot 5 = \frac{20}{6}$$

$$V_1 = 6 \cdot \left(-\frac{20}{6}\right) = -20V$$

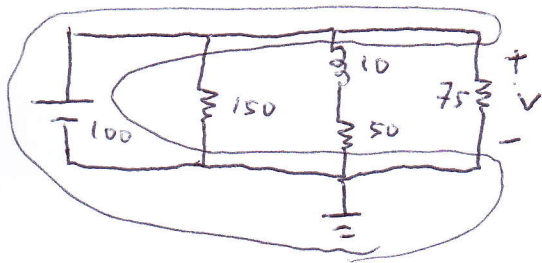
$$V_2 = 6 \cdot \left(\frac{20}{6}\right) = 20V$$

2). Jika  $i(0^-) = 2A$ , carilah  $v(0^-)$ ,  $v(0^+)$  dan  $\frac{di(0^+)}{dt}$



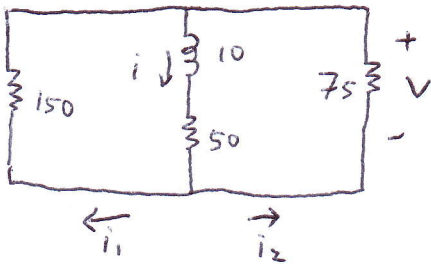
Jawab:

Rangk. saat  $t=0^-$



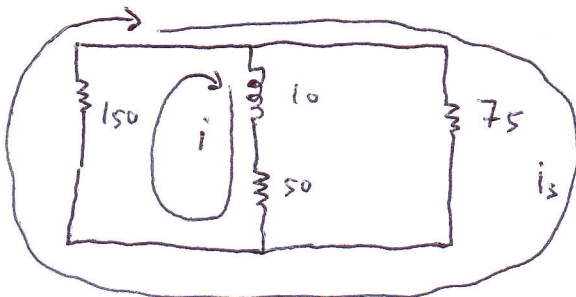
$$V(0^-) = 100 \text{ volt}$$

Rangk. saat  $t=0^+$   $i(0^+) = i(0^-) = 2A$



$$i_2 = \frac{150}{150 + 75} \times i = \frac{150}{225} \times 2 = \frac{4}{3}$$

$$V = 75(-i_2) = -100 \text{ volt}$$



Loop 1 :

$$10 \frac{di}{dt} + 50i + 150(i + i_3) = 0$$

$$10 \frac{di}{dt} + 200i + 150i_3 = 0 \dots$$

$$i = 2A$$

$$i_3 = -i_2 = -\frac{4}{3}$$

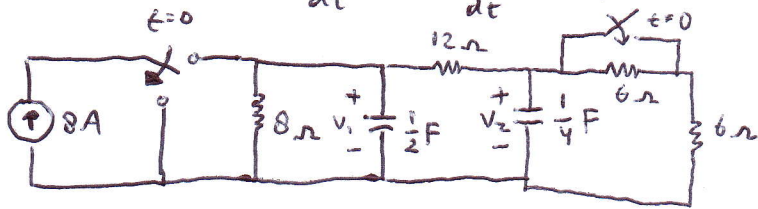
$$10 \frac{di}{dt} + 200i + 150i_3 = 0$$

$$\frac{di}{dt} + 20i + 15i_3 = 0$$

$$\frac{di}{dt} = -20 \cdot 2 - 15 \cdot \left(-\frac{4}{3}\right)$$

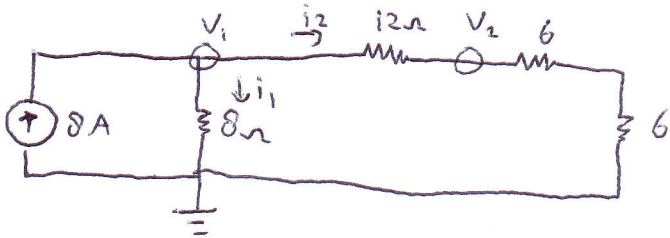
$$= -40 + 20 = -20 \text{ A/s}$$

3) Jika rangkaian steady state saat  $t=0^-$ , carilah  $\frac{dv_1}{dt}$  dan  $\frac{dv_2}{dt}$  saat  $t=0^+$ .



Jawab

Rangk. saat  $t=0^-$



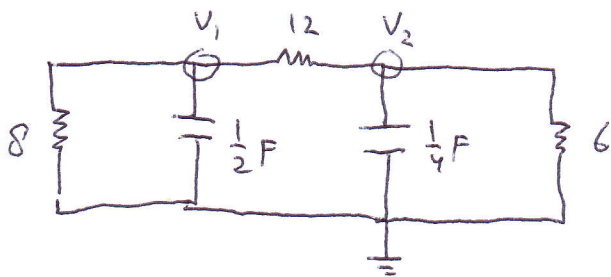
$$i_1 = \frac{12+6+6}{12+6+6+8} \times 8 = \frac{24}{32} \times 8 = 6 \text{ A}$$

$$V_1 = 8 \times 6 = 48 \text{ volt}$$

$$i_2 = 8 - i_1 = 2 \text{ A}$$

$$V_2 = (6+6) \times 2 = 24 \text{ volt}$$

Rangk. saat  $t=0^+$



$$V_1(0^+) = V_1(0^-) = 48$$

$$V_2(0^+) = V_2(0^-) = 24$$

KCL  $V_1$ :

$$\frac{V_1}{8} + C \cdot \frac{dV_1}{dt} + \frac{V_1 - V_2}{12} = 0$$

$$\frac{48}{8} + \frac{1}{2} \cdot \frac{dV_1}{dt} + \frac{48-24}{12} = 0$$

$$\frac{dV_1}{dt} = 2(-6-2) = -16 \text{ V/s}$$

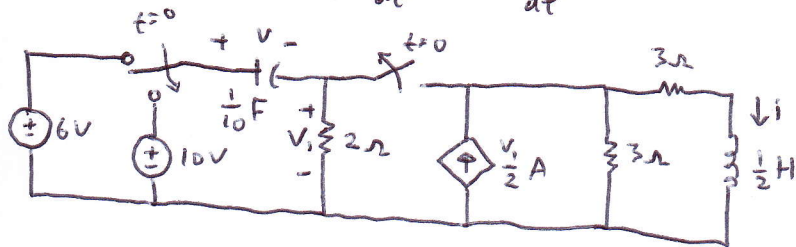
KCL  $V_2$ :

$$\frac{V_2 - V_1}{12} + \frac{1}{4} \frac{dV_2}{dt} + \frac{V_2}{6} = 0$$

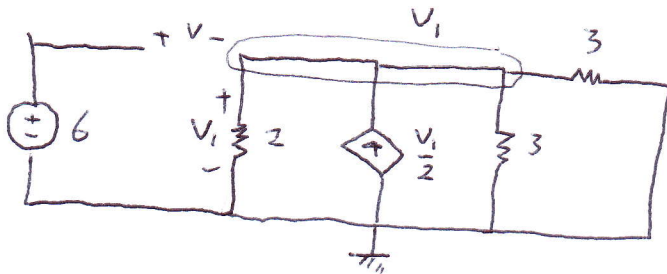
$$\frac{24-48}{12} + \frac{1}{4} \frac{dV_2}{dt} + \frac{24}{6} = 0$$

$$\frac{dV_2}{dt} = 4(+2-4) = -8 \text{ V/s}$$

4. Jika rangkaian steady state saat  $t=0^-$ , carilah  $\frac{dv}{dt}$  dan  $\frac{di}{dt}$  saat  $t=0^+$



Jawab: Rangk. saat  $t=0^-$



Kel node  $V_1$ :

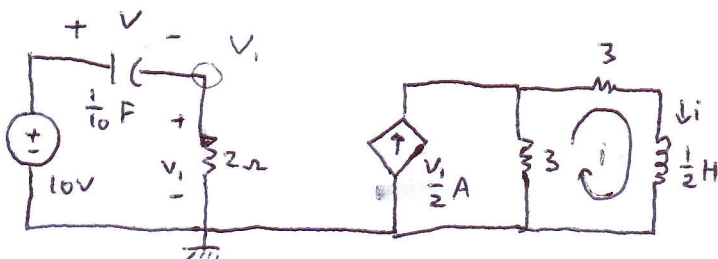
$$\frac{V_1}{2} + \left(-\frac{V_1}{2}\right) + \frac{V_1}{3} + \frac{V_1}{3} = 0$$

$$V_1 = 0$$

$$i = 0$$

$$V = 6 - 0 = 6 \text{ volt}$$

Rangk. saat  $t=0^+$



$$V(0^+) = V(0^-) = 6 \quad V_1 = 10 - V = 4 \text{ volt}$$

$$i(0^+) = i(0^-) = 0$$

node  $V_1$ :

$$-\frac{1}{10} \frac{dV}{dt} + \frac{V_1}{2} = 0$$

$$\frac{dV}{dt} = -10 \times -2 = 20 \text{ V/s}$$

loop i:

$$\frac{1}{2} \frac{di}{dt} + 3\left(i - \frac{V_1}{2}\right) + 3i = 0$$

$$\frac{1}{2} \frac{di}{dt} + 3(0 - 2) + 3 \cdot 0 = 0$$

$$\frac{di}{dt} = 6 \times 2 = 12 \text{ A/s}$$