

1. 1) $i_1 = 5 \quad i_2 = -5$

$$q_1 = 5t + c = 5t + 1$$

$$q_2 = -5t + c = -5t + c = -5t + 21$$

$$q_1(0) = q(0) = 1$$

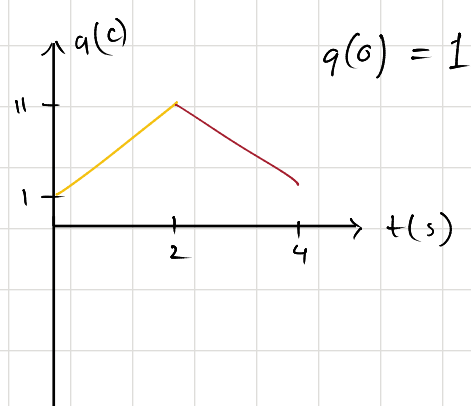
$$q_2(2) = q_1(2) = 5 \cdot 2 + 1 = 11$$

$$\Rightarrow c = 1$$

$$\Rightarrow -5 \cdot 2 + c = 11$$

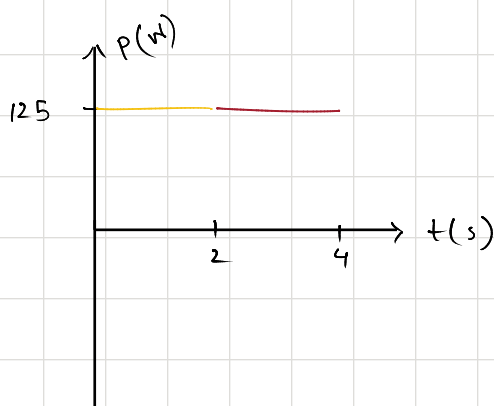
$$\Rightarrow c = 21$$

$$q_2(4) = -20 + 21 = 1$$



11) $p = i^2 R \quad p_1 = 5^2 \times 5 = 125 \text{ W}$

$$p_2 = (-5)^2 \times 5 = 125 \text{ W}$$



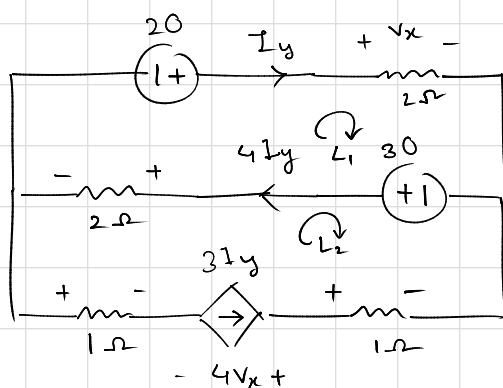
$$i_1 = 5 \quad i_2 = -5$$

2. loop 1

$$-20 + 2I_y - 30 + 2 \cdot 4I_y = 0$$

$$\Rightarrow -20 + 10I_y - 30 = 0$$

$$\Rightarrow I_y = \frac{50}{10} = 5$$



loop 2:

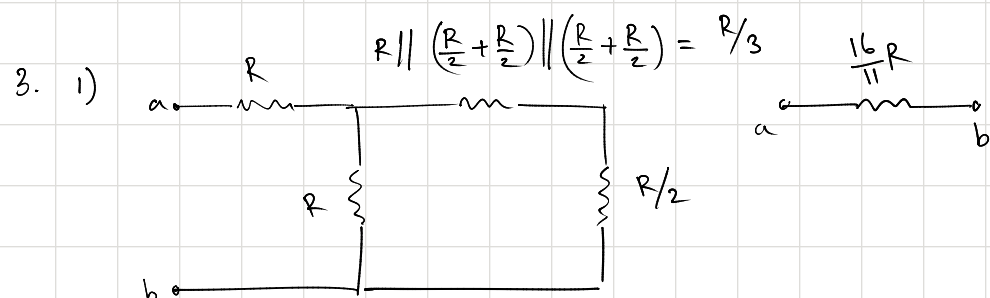
$$-2 \cdot 4I_y + 30 - 3I_y + 4V_x - 3I_y = 0$$

$$\Rightarrow -8I_y + 30 - 3I_y + 4V_x - 3I_y = 0$$

$$\Rightarrow -14I_y + 30 + 4V_x = 0$$

$$\Rightarrow 4V_x = 14 \cdot 5 - 30 = 40$$

$$\Rightarrow V_x = 10$$



$$R_{eq} = 10$$

$$\Rightarrow \frac{16}{11} R = 10$$

$$\Rightarrow R = 6.875 \Omega$$

$$\begin{aligned} & R + R \parallel \left(\frac{R}{3} + \frac{R}{2} \right) \\ &= R + \left(\frac{1}{\frac{R}{3}} + \frac{6}{5R} \right)^{-1} \\ &= R + \left(\frac{5+6}{5R} \right)^{-1} \\ &= R + \frac{5R}{11} \\ &= \frac{16}{11} R \end{aligned}$$

$$11) v_{ac} = 30 \times 5 \parallel 20 \parallel 4$$

$$= 30 \times 2$$

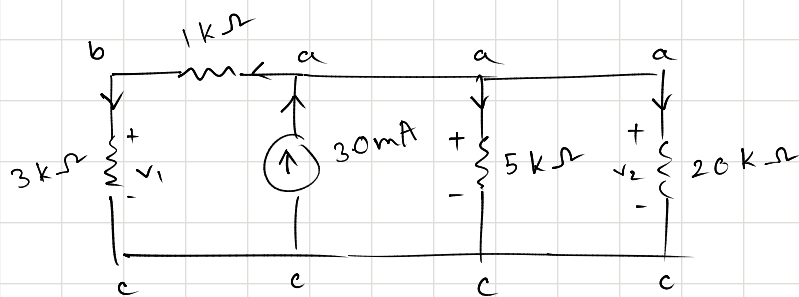
$$= 60 \text{ V}$$

$$v_z = 60 \text{ V}$$

$$v_{bc} = 60 \times \frac{3}{3+1}$$

$$= 45 \text{ V}$$

$$v_1 = 45 \text{ V}$$



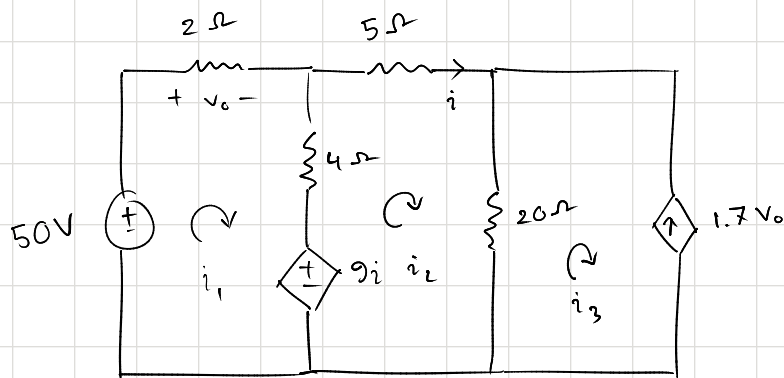
4. i) loop 1

$$-50 + 2i_1 + 4(i_1 - i_2) + 9i_1 = 0$$

$$\Rightarrow 2i_1 + 4i_1 - 4i_2 + 9i_1 - 50 = 0$$

$$\Rightarrow 6i_1 + 5i_2 = 50$$

$$\Rightarrow 3v_o + 5i_2 = 50$$



loop 2

$$-9i_1 + 4(i_2 - i_1) + 5i_2 + 20(i_2 - i_3) = 0$$

$$\Rightarrow -9i_2 + 4i_2 - 4i_1 + 5i_2 + 20i_2 - 20i_3 = 0$$

$$\Rightarrow -4i_1 + 20i_2 - 20i_3 = 0$$

$$\Rightarrow -2v_o + 20i_2 + 20 \times 1.7v_o = 0$$

$$\Rightarrow 32v_o + 20i_2 = 0$$

$$v_o = -10 \quad i_2 = 16 = i$$

11) node 1

$$\frac{v_1}{10} + \frac{v_1 - v_2}{2} + 6 + \frac{v_1}{5} = 0$$

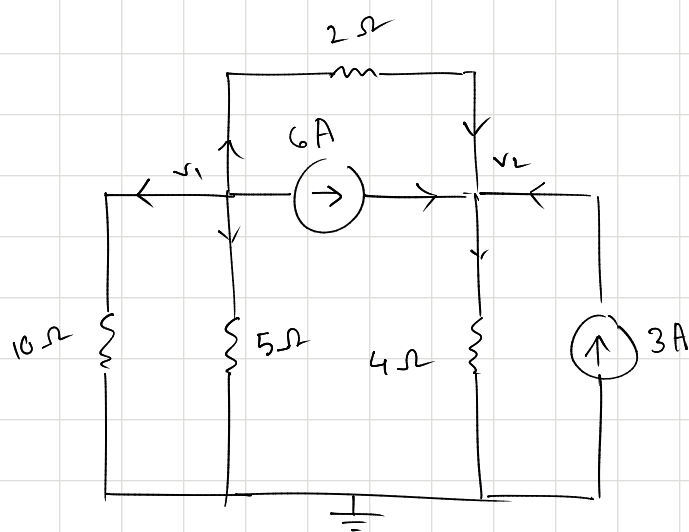
$$\Rightarrow \frac{4}{5}v_1 - \frac{1}{2}v_2 + 6 = 0 \quad \text{--- (1)}$$

node 2

$$6 + \frac{v_1 - v_2}{2} + 3 = \frac{v_2}{4}$$

$$\Rightarrow \frac{v_1}{2} - \frac{v_2}{2} - \frac{v_2}{4} = -9$$

$$\Rightarrow \frac{1}{2}v_1 - \frac{3}{4}v_2 = -9 \quad \text{--- (11)}$$



solve (1) and (11)

$$v_1 = 0 \quad v_2 = 12$$