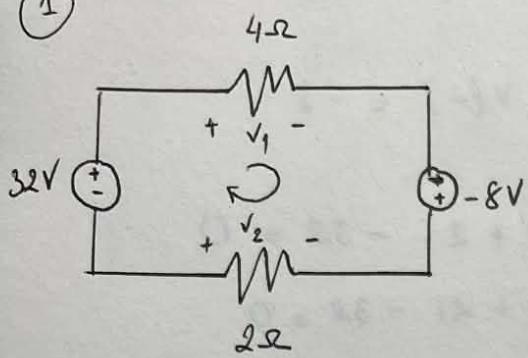


Assignment 1

①



$$v_1 = 4i \quad (\text{from left to right})$$

$$v_2 = -2i \quad (\text{from right to left})$$

$$V(+)-V(-) = -8 \Rightarrow V_{\text{top}} - V_{\text{bot}} = +8V$$

KVL (clockwise)

$$v_1 + 8 + 2i - 32 = 0$$

$$\Rightarrow 4i + 8 + 2i - 32 = 0$$

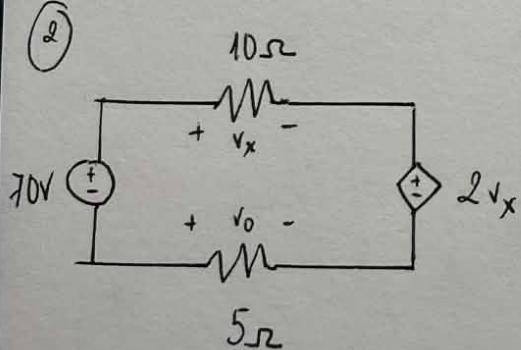
$$\Leftrightarrow 6i = 24$$

$$\Leftrightarrow i = 4$$

$$\circ v_1 = 4i \Rightarrow v_1 = 16V$$

$$\circ v_2 = -2i \Rightarrow v_2 = -8V$$

②



$$v_x = 10i$$

$$v_0 = -5i$$

KVL (clockwise)

$$v_x + 2v_x + 5i - 70 = 0$$

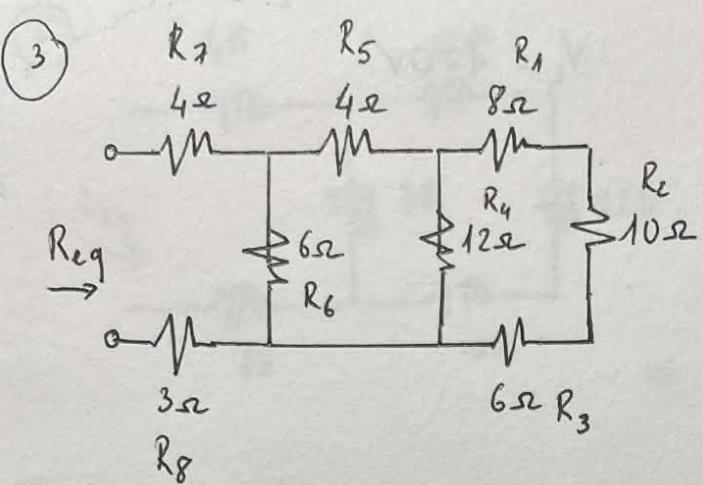
$$\Leftrightarrow 10i + 20i + 5i - 70 = 0$$

$$\Leftrightarrow 35i = 70$$

$$\Leftrightarrow i = 2A$$

$$\circ v_x = 10i \Rightarrow 20V$$

$$\circ v_0 = -5i \Rightarrow -10V$$



$$R_1 + R_2 + R_3 = 8 + 10 + 6 \\ = 24 \Omega$$

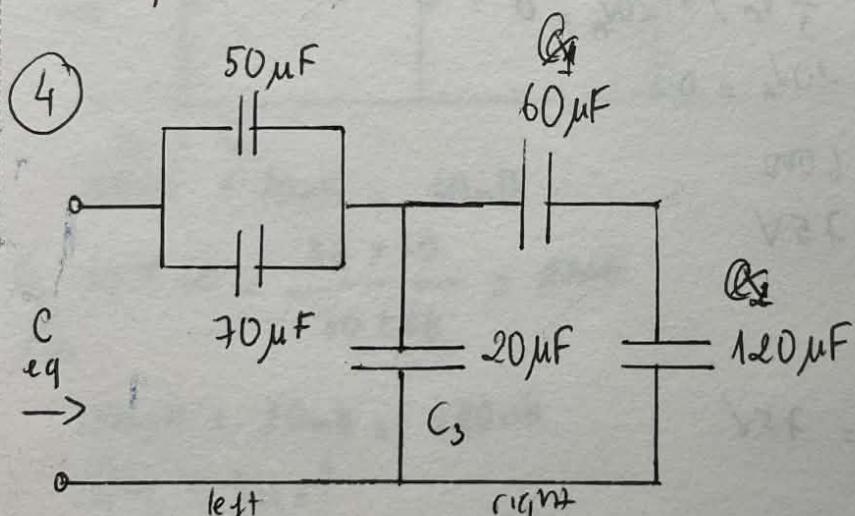
$$R_{123} \parallel R_4 = \frac{24 \times 12}{24 + 12} = 8 \Omega$$

$$R_5 + R_{1234} = 4 + 8 = 12 \Omega$$

$$R_6 \parallel R_{12345} = \frac{6 \times 12}{6 + 12} = 4 \Omega$$

$$R_7 + R_{123456} = 4 + 8 = 12 \Omega$$

$$R_{eq} = R_8 + R_{1234567} = 3 + 8 = 11 \Omega$$



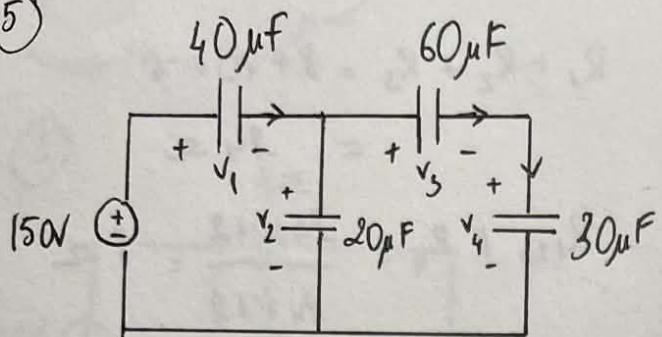
$$C_{left} = 50 + 70 = 120 \mu F$$

$$C_1 \parallel C_2 = \frac{60 * 120}{60 + 120} = 40 \mu F$$

$$C_3 + C_{12} = 20 + 40 \mu F = 60 \mu F \text{ (right)}$$

$$C_{eq} = \frac{120 \times 60}{120 + 60} = \frac{7200}{180} = \boxed{40 \mu F}$$

(5)



$$v_L = 150V$$

$$\bullet \quad 60(v_B - v_A) + 30(v_B - 0) = 0$$

$$\Leftrightarrow 90v_B = 60v_A$$

$$\Leftrightarrow v_B = \frac{2}{3}v_A$$

$$\bullet \quad 40(v_A - 150) + 60(v_A - v_B) + 20v_A = 0$$

$$\Leftrightarrow 40v_A - 6000 + 60(v_A - \frac{2}{3}v_A) + 20v_A = 0$$

$$\Leftrightarrow 40v_A - 6000 + 20v_A + 20v_A = 0$$

$$\Leftrightarrow 80v_A = 6000$$

$$\Leftrightarrow v_A = 75V$$

$$\bullet \quad v_B = \frac{2}{3}v_A = 50V$$

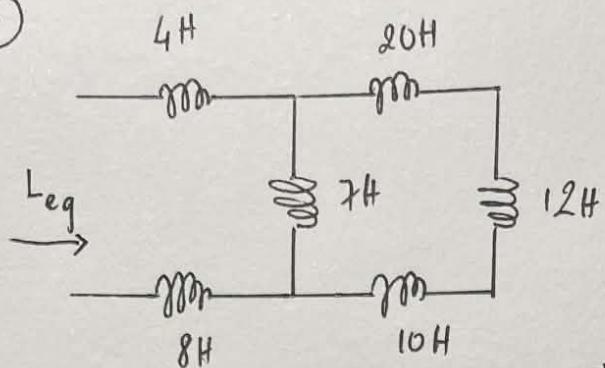
$$\bullet \quad v_1 = 150 - v_A = 150 - 75 = 75V$$

$$v_2 = v_A - 0 = 75V$$

$$v_3 = v_A - v_B = 75 - 50 = 25V$$

$$v_4 = v_B - 0 = 50V$$

(6)



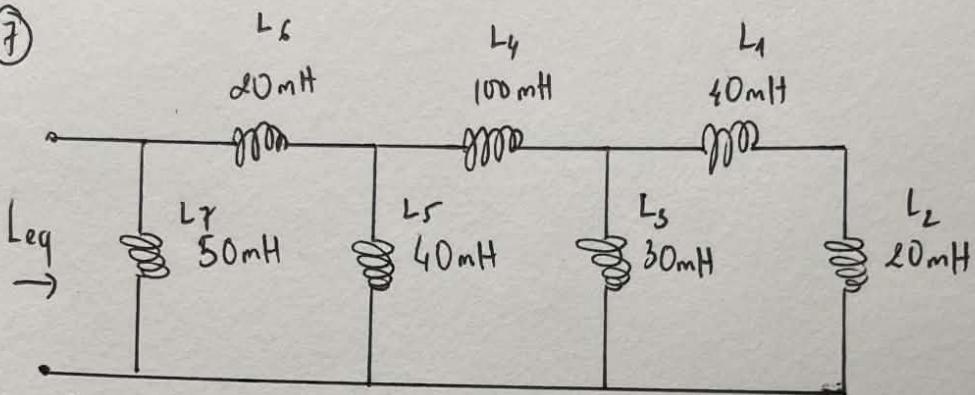
$$20H + 12H + 10H = 42H$$

$$42H \parallel 7H = \frac{7 \times 42}{7+42} = 6H$$

$$4H + 6H + 8H = 18H$$

$$\Rightarrow L_{eq} = 18H$$

(7)



$$L_1 + L_2 \\ 40mH + 20mH = 60mH$$

$$L_6 \parallel L_7 = \frac{30 \times 60}{30 + 60} = 20mH$$

$$100mH + 20mH = 120mH \\ (L_4 + L_{123})$$

$$L_{1234} \parallel L_5 = \frac{40 \times 120}{40 + 120} = 30mH$$

$$L_{12345} + L_6 = 30 + 20 = 50mH$$

$$L_{123456} \parallel L_7 = \frac{50 \times 50}{50 + 50} = 25mH$$

$$\Rightarrow L_{eq} = 25mH$$