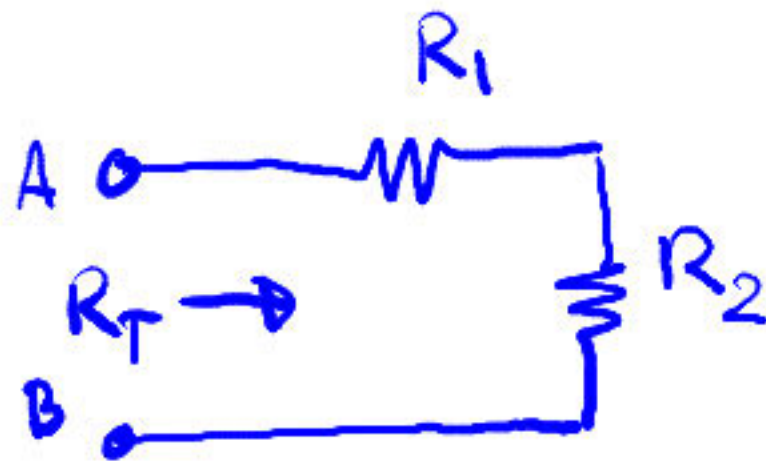


บททวนความรู้แล้ว

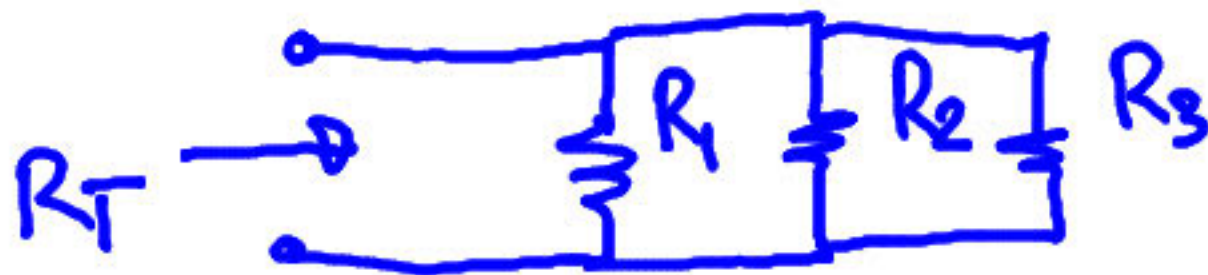
Circuit element Combination

- Series



$$R_T = R_1 + R_2$$

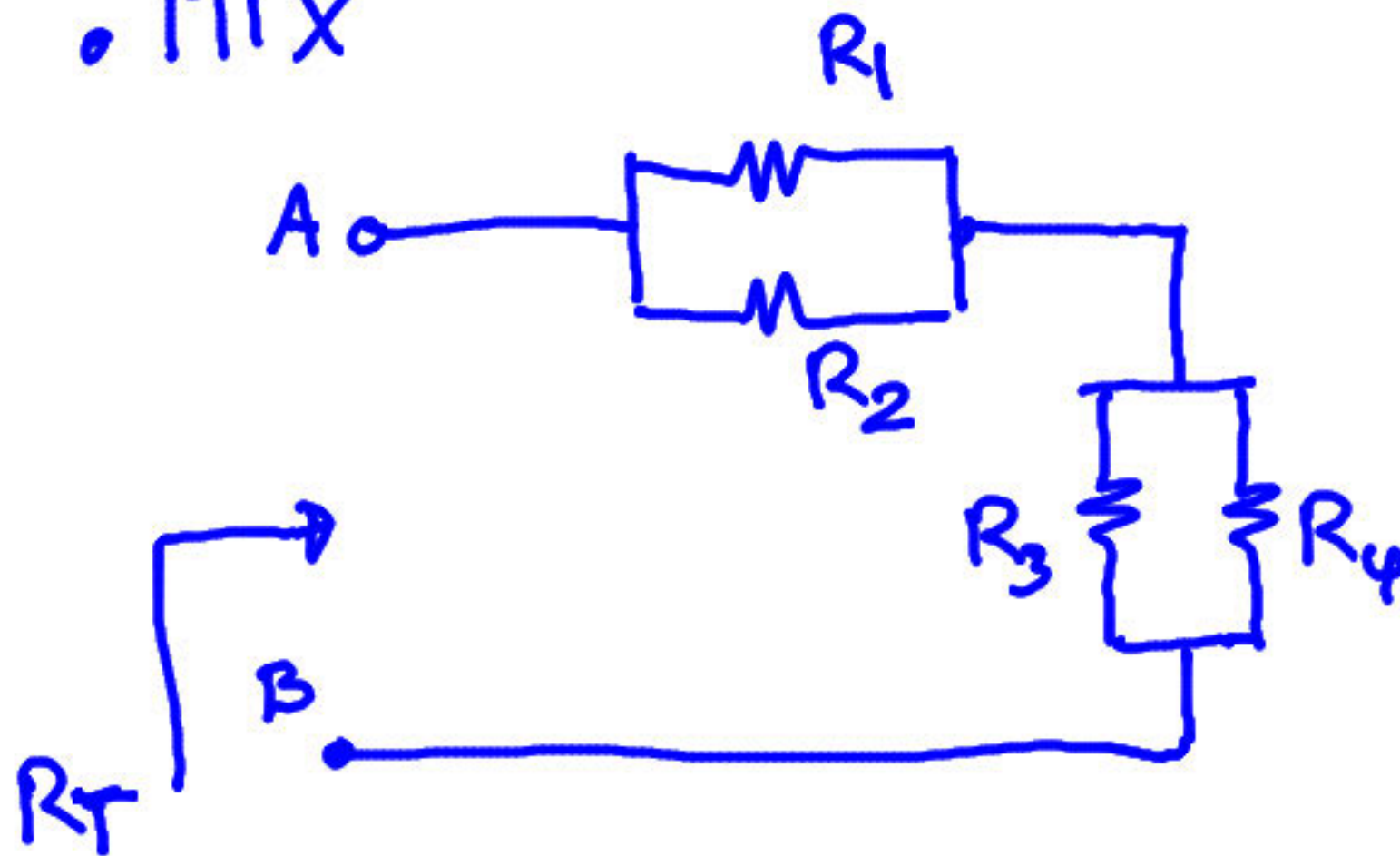
- Parallel



$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$R_T = \frac{R_1 R_2 R_3}{R_1 + R_2 + R_3}$$

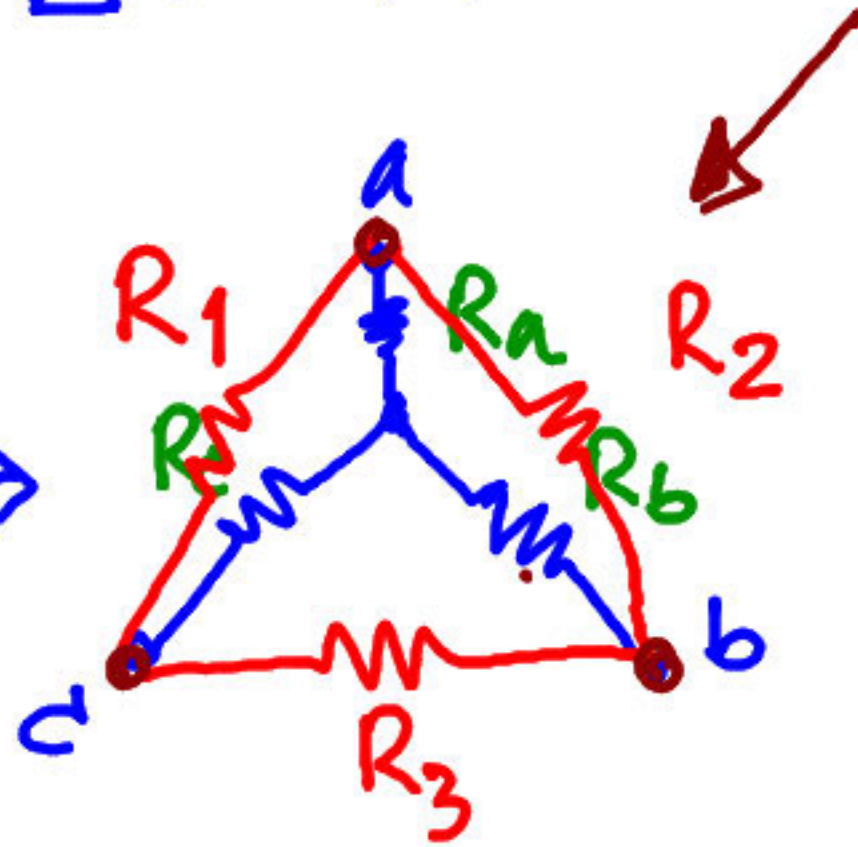
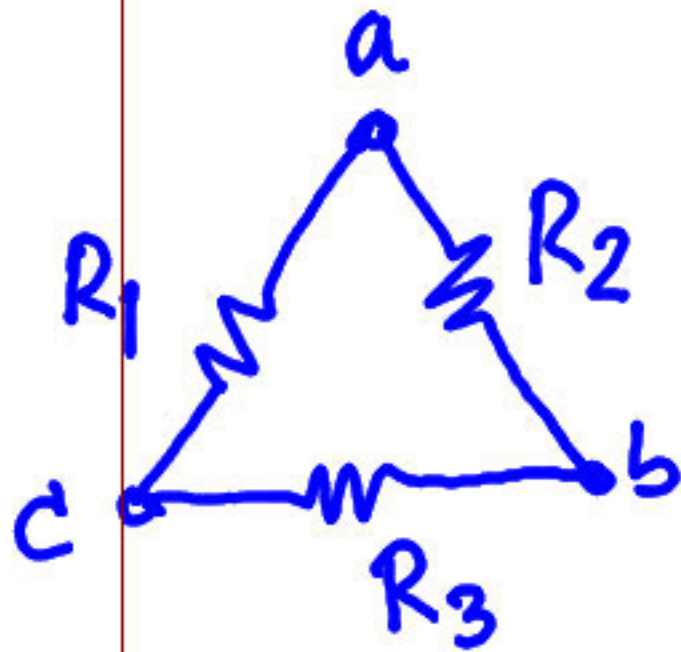
• Mix



$$R_T = (R_1 // R_2) + (R_3 // R_4)$$

$$R_T = \frac{R_1 R_2}{R_1 + R_2} + \frac{R_3 R_4}{R_3 + R_4}$$

• Complex ($\Delta \leftrightarrow Y$)



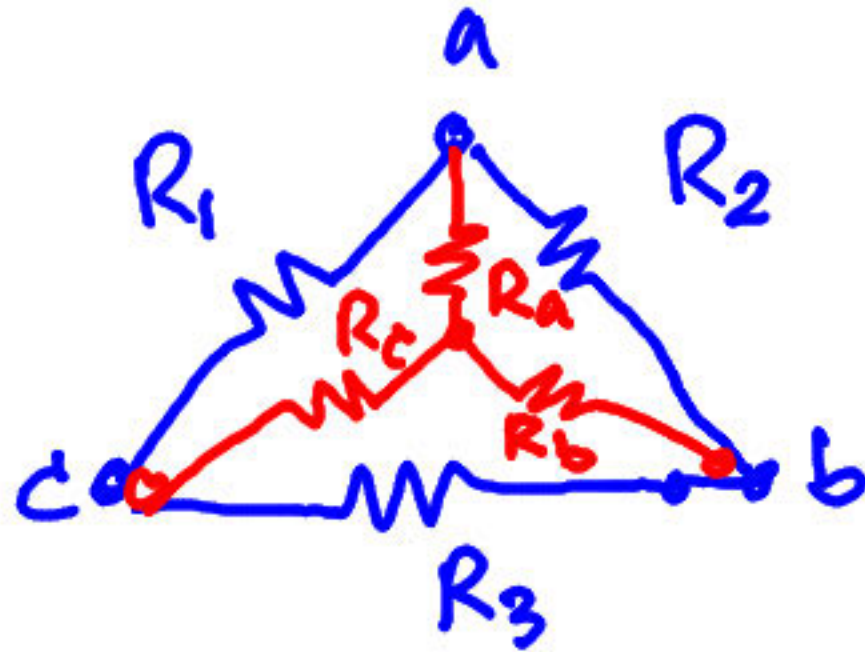
$\Delta \rightarrow Y$

$$R_a = \frac{R_1 R_2}{R_1 + R_2 + R_3}$$

$$R_b = \frac{R_2 R_3}{R_1 + R_2 + R_3}$$

$$R_c = \frac{R_1 R_3}{R_1 + R_2 + R_3}$$

$$Y \rightarrow \Delta$$



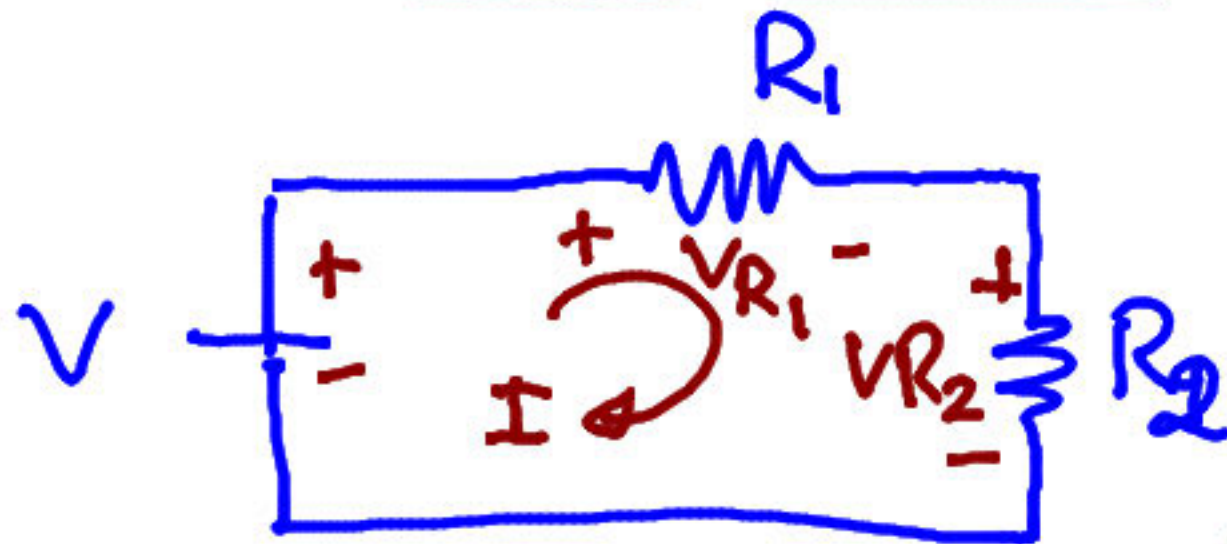
$$R_1 = \frac{R_a R_b + R_b R_c + R_c R_a}{R_b}$$

$$R_2 = \frac{R_a R_b + R_b R_c + R_c R_a}{R_c}$$

$$R_3 = \frac{R_a R_b + R_b R_c + R_c R_a}{R_a}$$

• Circuits Connection

→ Voltage Divider $\Rightarrow$ $\frac{24}{1+5} = 4$



Ohm's Law

$$V_{R2} = I \cdot R_2$$

$$V_{R2} = \frac{V}{R_1 + R_2} \cdot R_2$$

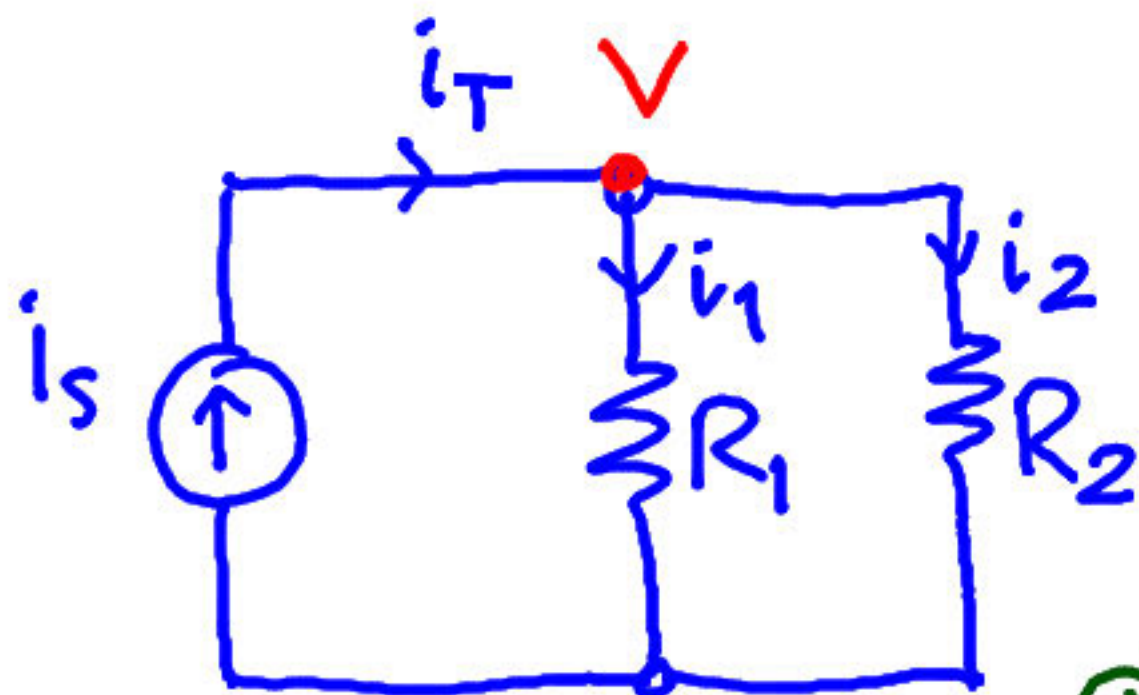
$$I = \frac{V}{R_1 + R_2}$$

$$V_{R1} = I \cdot R_1$$

$$V_{R1} = \frac{V}{R_1 + R_2} \cdot R_1$$

Current Divider

⇒ 2 resistors



Ohm's Law

$$i_T = \frac{R_2 + R_1 \cdot V}{R_1 \cdot R_2}$$

$$i_T = \frac{V}{R_1} + \frac{V}{R_2}$$

$$R_T = \frac{R_1 R_2}{R_1 + R_2}$$

$$i_1 = \frac{V}{R_1}$$

$$i_2 = \frac{V}{R_2}$$

$$i_T = \left(\frac{1}{R_1} + \frac{1}{R_2} \right) \cdot V$$

$$i_T = \left(\frac{R_2 + R_1}{R_1 \cdot R_2} \right) \cdot V \Rightarrow$$

$$V = i_T \left(\frac{R_1 \cdot R_2}{R_2 + R_1} \right)$$

$$i_1 = \frac{V}{R_1}$$

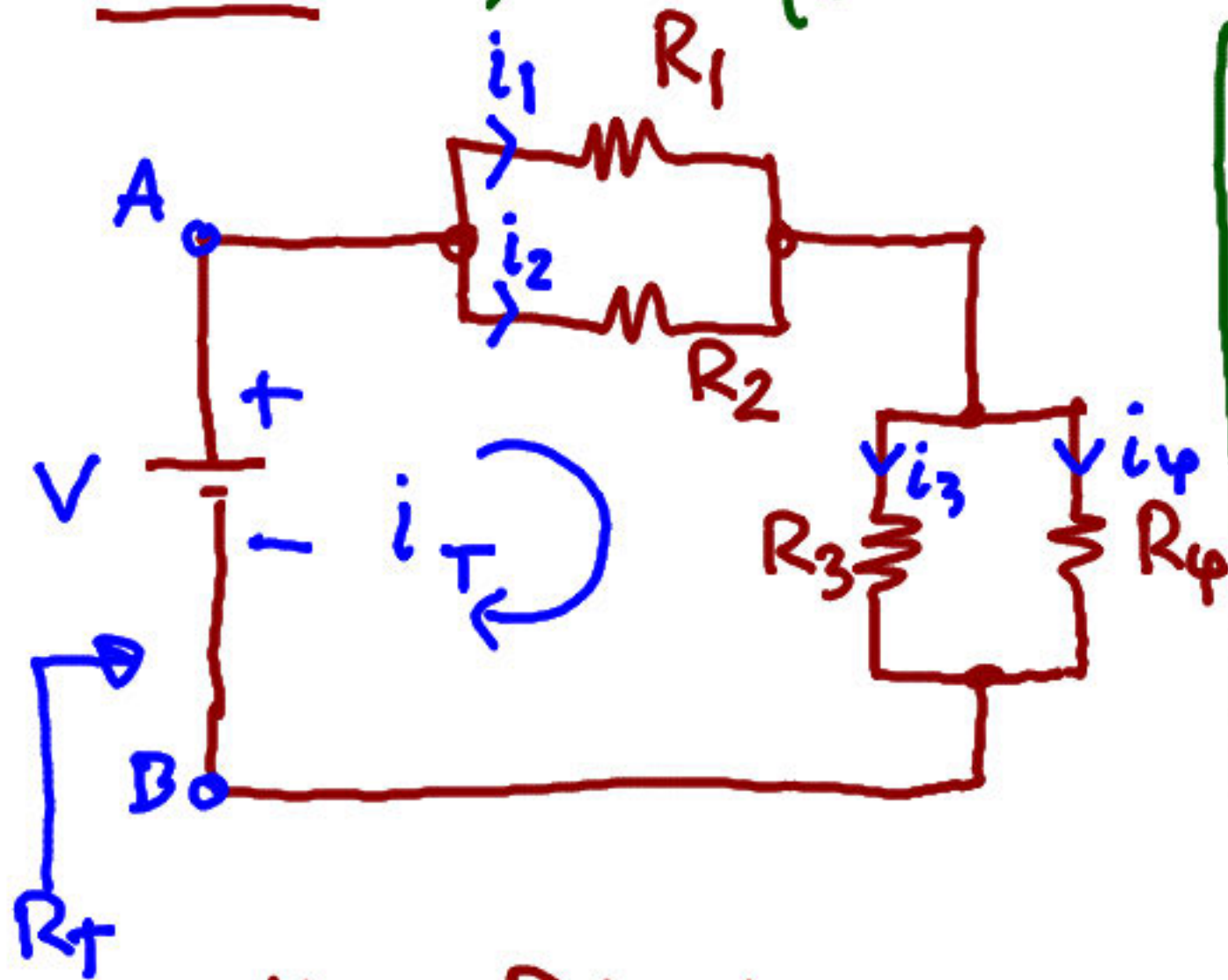
$$, \boxed{V = i_T \left(\frac{R_1 \cdot R_2}{R_1 + R_2} \right)}$$

$$\therefore i_1 = i_T \left(\frac{\cancel{R_1} \cdot R_2}{R_1 + R_2} \right) / \cancel{R_1} = i_T \left(\frac{R_2}{R_1 + R_2} \right)$$

$$\boxed{i_1 = \frac{R_2}{R_1 + R_2} \cdot i_T}$$

$$, \boxed{i_2 = \frac{R_1}{R_1 + R_2} \cdot i_T}$$

Mix $\Rightarrow$ Voltage Divider + Current Divider



$$R_{12} = \frac{R_1 R_2}{R_1 + R_2}$$

$$R_{34} = \frac{R_3 R_4}{R_3 + R_4}$$

$$R_T = R_{12} + R_{34}$$

$$i_T = \frac{V}{R_T}$$

Voltage Divider

$$V_{R_{12}} = \frac{R_{12}}{R_{12} + R_{34}} \cdot V$$

$$V_{R_{34}} = \frac{R_{34}}{R_{12} + R_{34}} \cdot V$$

Ohm's Law

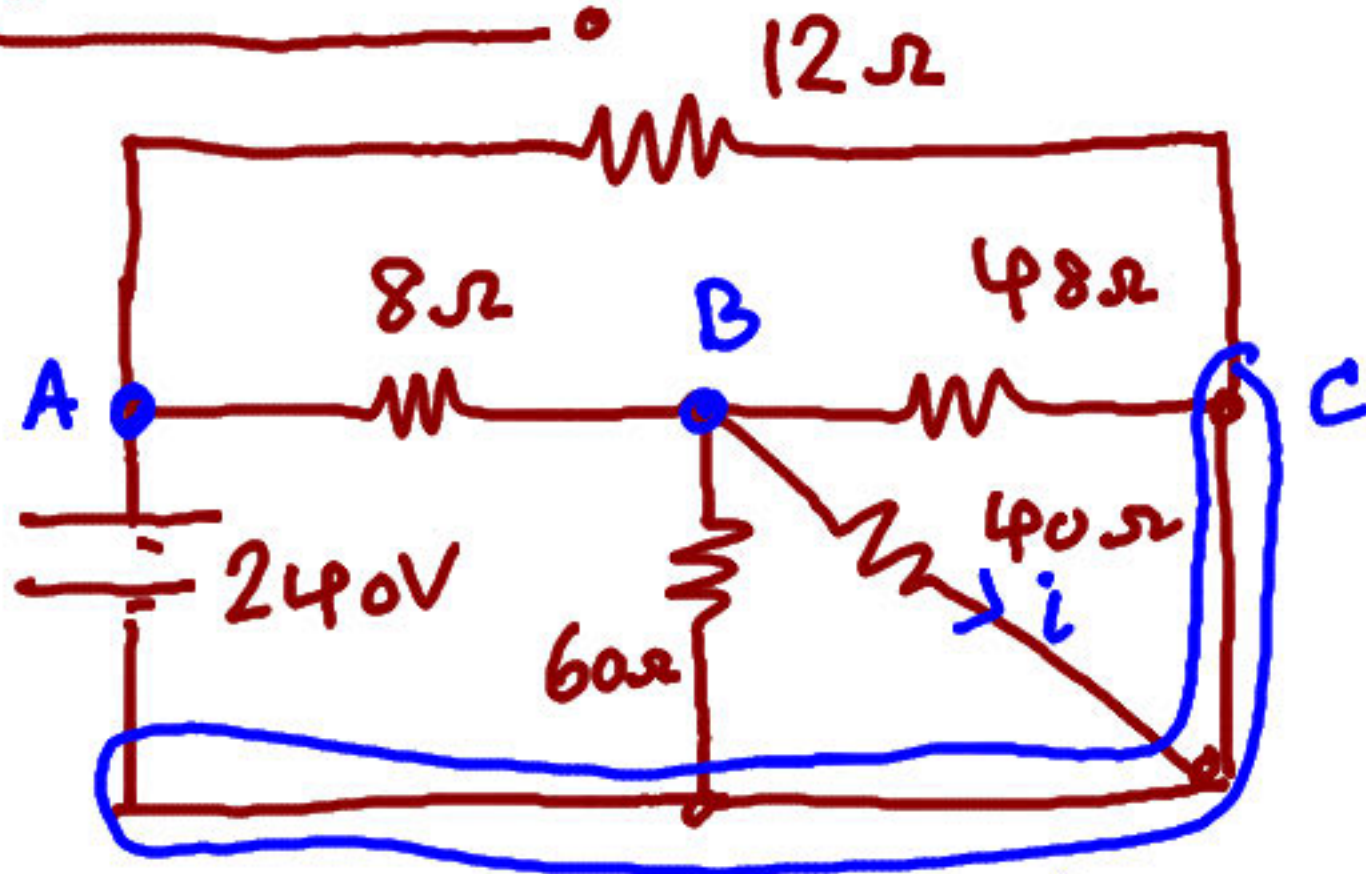
$$i_1 = \frac{VR_{12}}{R_1}$$

$$i_2 = \frac{VR_{12}}{R_2}$$

$$i_3 = \frac{VR_{34}}{R_3}$$

$$i_4 = \frac{VR_{34}}{R_4}$$

• หาค่ากระแส •



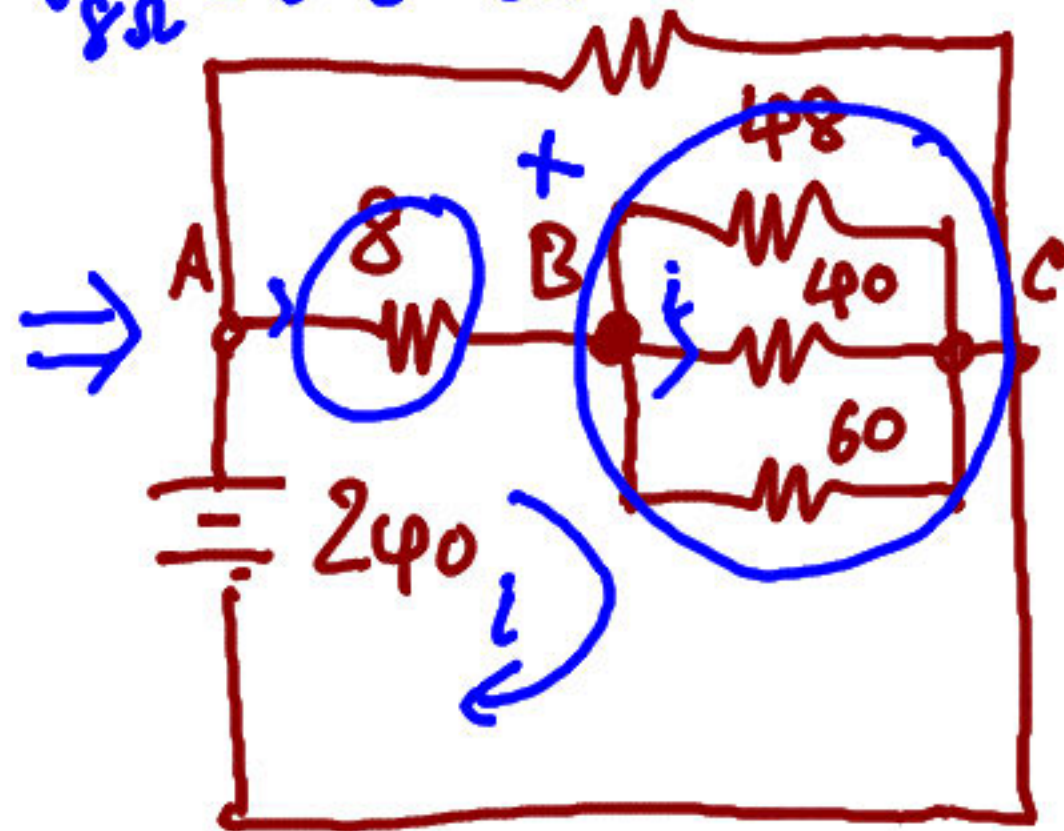
$$i = \frac{240}{8 + 16} = 10 \text{ A}$$

$$V_{BC} \rightarrow i_{40\Omega} = \frac{V_{BC}}{40\Omega} \cdot \frac{160}{40} = 4 \text{ A}$$

$$R_{BC} = \frac{48 \cdot 40 \cdot 60}{40 + 48 + 60} = 16 \Omega$$

$$240 = V_{AC} = V_{AB} + V_{BC}$$

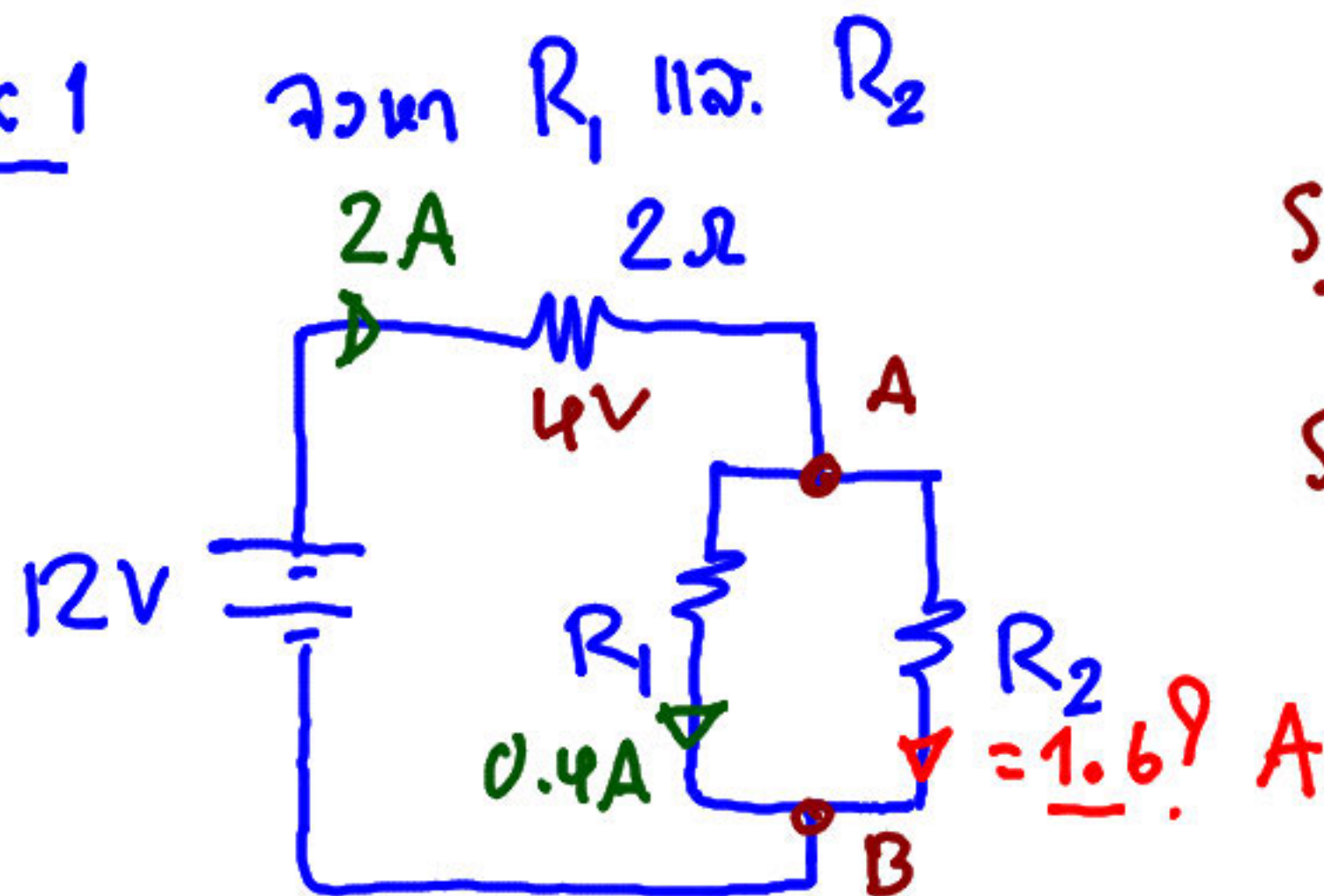
$$V_{8\Omega} = i \cdot 8 = 80 \text{ V}$$



$$\frac{1}{R_{BC}} = \frac{1}{48} + \frac{1}{40} + \frac{1}{60}$$

$$R_{BC} = \frac{40 + 48 + 60}{\frac{1}{48} + \frac{1}{40} + \frac{1}{60}}$$

Ex 1



Step ① $i_{R_2} = 1.6A$

Step ② V_{R_2}

$$V_{R_2} = i \times R$$
$$= 2A \times 2\Omega$$
$$= 4V$$

Step ③

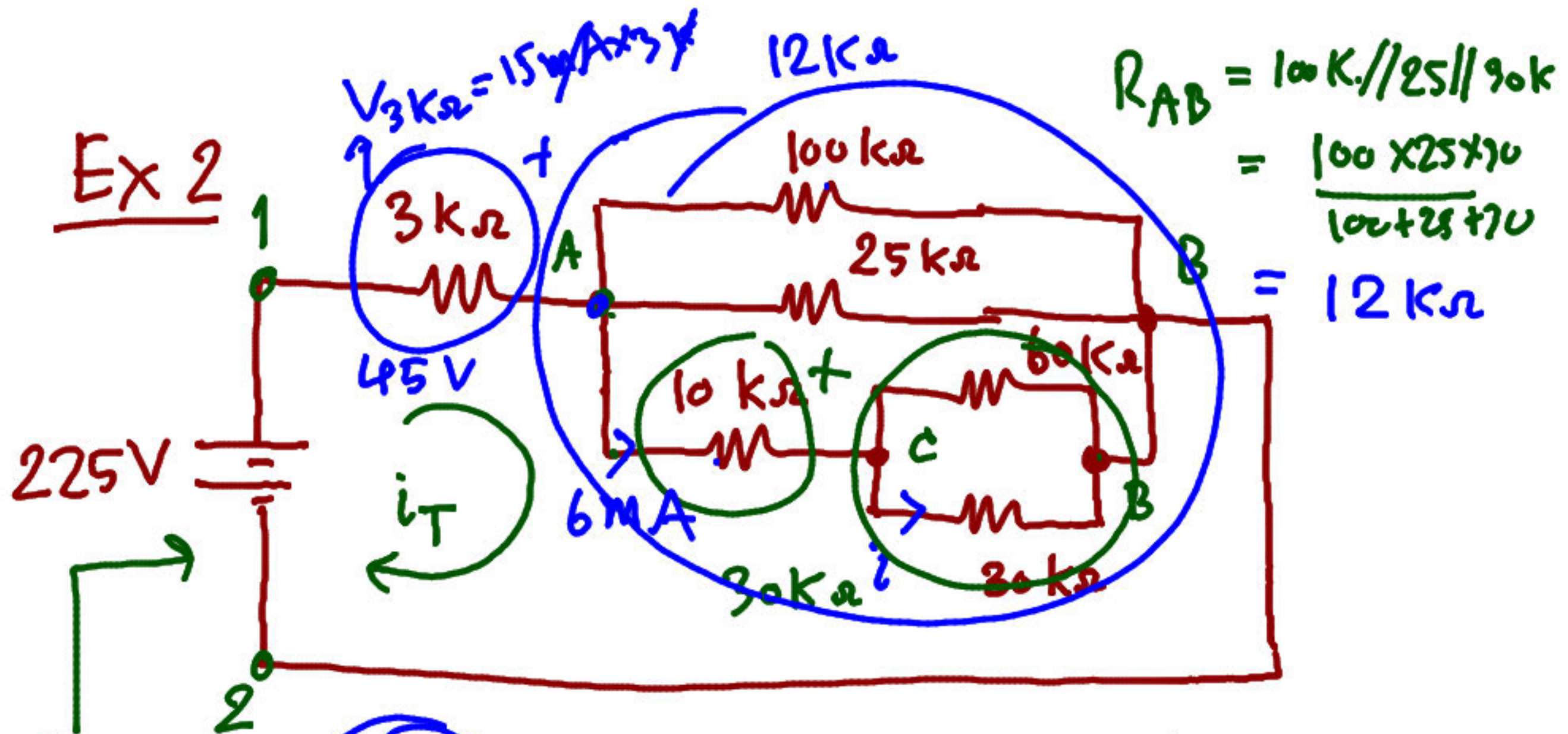
$$R_1 = \frac{V_{AB}}{0.4A} = \frac{8}{0.4} = 20\Omega$$

$$R_2 = \frac{V_{AB}}{1.6A} = \frac{8}{1.6} = 5\Omega$$

$$\therefore V_{AB} = 12 - 4$$
$$= 8V$$



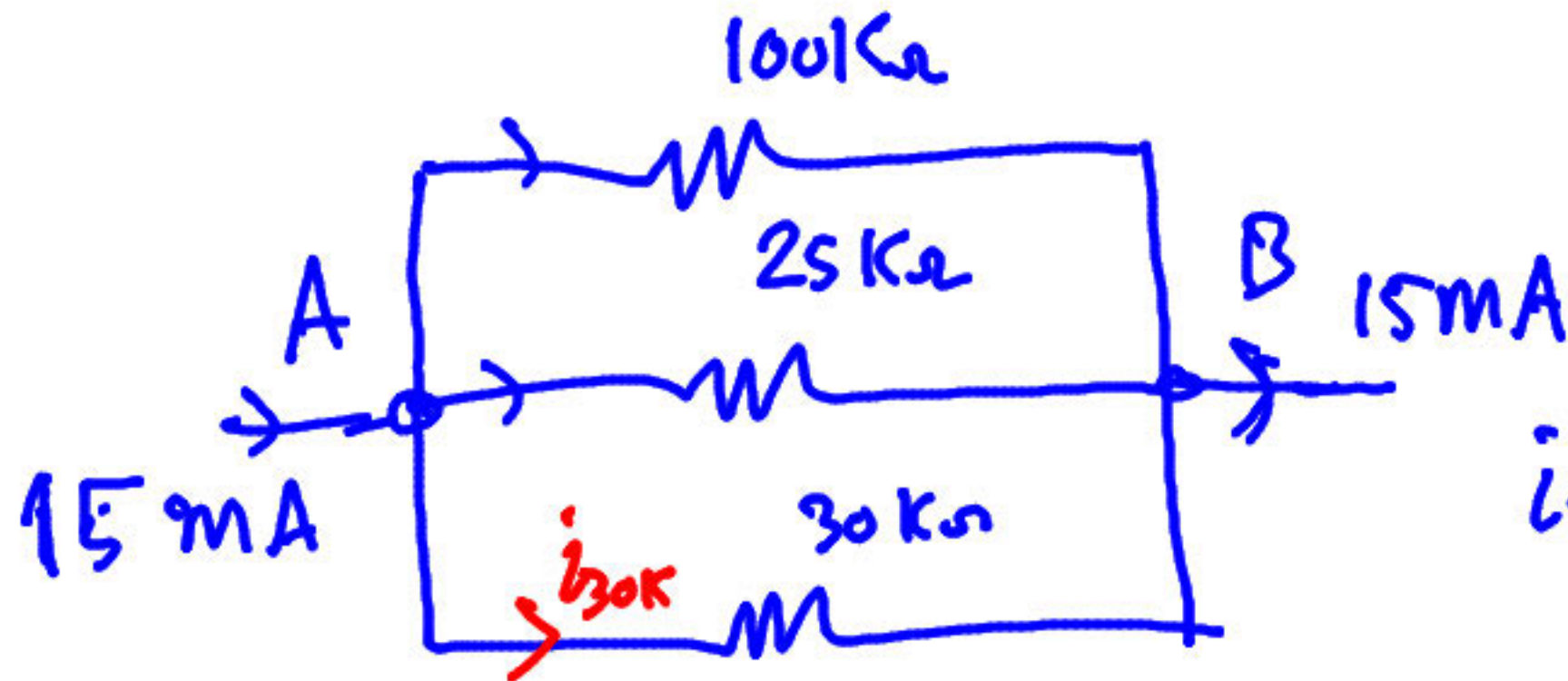
f_x 991 SE 650-1,00



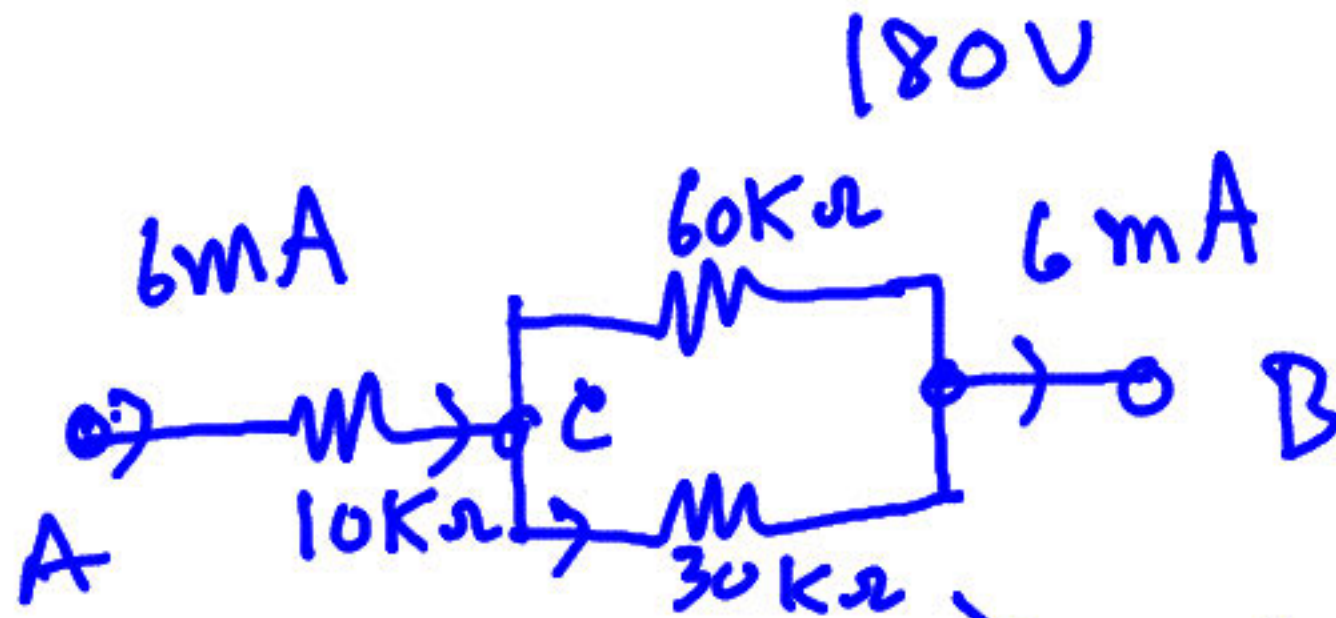
$V_{AB} \rightarrow V_{AC} \rightarrow V_{BC} \rightarrow i = \frac{V_{BC}}{30k\Omega}$

$i_T = \frac{225}{R_T} = \frac{225}{15000} = 15mA, \therefore V_{AB} = 225 - 45 = 180V$

$$i = \frac{1}{R}$$



$$i_{30k} = \frac{180}{30000} = 6 \text{ mA}$$



180

$$i_{30} = \frac{60k\Omega}{30k\Omega + 60k\Omega} \times 6 \text{ mA} = 2 \text{ mA}$$

$$i_{25k} = \frac{180}{25,000} = 7.2 \text{ mA}$$

$$i_{100k} = \frac{180}{100,000} = 1.8 \text{ mA}$$