$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \quad [Parallel]$$
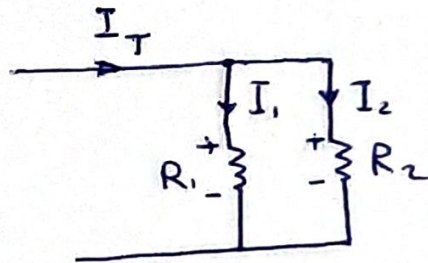
$$I_1 = \frac{V_1}{R_1} \quad , \quad I_2 = \frac{V_2}{R_2} \quad , \quad I_3 = \frac{V_3}{R_3}$$

$$V_1 = V_2 = V_3 = E$$

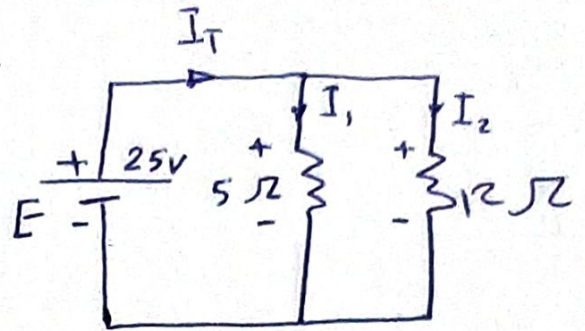قانون مقسّم التّيار (Current divide rule)

$$I_1 = \frac{I_T \cdot R_2}{R_1 + R_2}$$

$$I_2 = \frac{I_T \cdot R_2}{R_1 + R_2}$$

Ex:

For The Circuit Shown

① determine I_T, I_1 and I_2

② determine The power of each resistor?

Sol

$$I_T = ? , \quad I_1 = ? , \quad I_2 = ?$$
$$P_1 = ? , \quad P_2 = ?$$

① $I_T = \dfrac{E}{R_T}$

$\because \dfrac{1}{R_T} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$

$\therefore \dfrac{1}{R_T} = \dfrac{1}{5} + \dfrac{1}{12} \implies \dfrac{1}{R_T} = \dfrac{12+5}{60} = \dfrac{17}{60}$

$\therefore R_T = \dfrac{60}{17} \implies \boxed{R_T = 3.5 \, \Omega}$

$$\boxed{I_T = \dfrac{25}{3.5} = 7.1 \, A}$$

$I_1 = \dfrac{V_1}{R_1}$

$\therefore E = V_1 = V_2 \; [\text{Parallel}]$

$I_1 = \dfrac{25}{5} = \boxed{5 \, A}$

$I_2 = \dfrac{25}{12} = \boxed{2.1 \, A}$

② $P_1 = V_1 . I_1 \implies P_1 = 125 \, W$

$P_2 = V_2 . I_2 \implies P_2 = 52 \, W$

②

Ex₂ For Circuit shown

Find V_A, V_B, V_C

Sol

$$V_A = I_A \cdot R_A$$
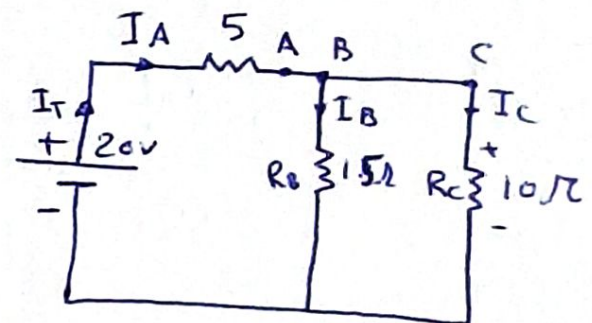
$$V_B = I_B \cdot R_B$$

$$V_C = I_C \cdot R_C$$

$$\therefore I_T = \frac{E}{R_T}$$

$$R_C = R_4 + R_3 \Rightarrow 3 + 7 \Rightarrow \boxed{R_C = 10\,\Omega}$$

$$\frac{1}{R_B} = \frac{1}{R_2} + \frac{1}{R_3} \Rightarrow \frac{1}{R_B} = \frac{1}{2} + \frac{1}{6} \Rightarrow \boxed{R_B = 1.5\,\Omega}$$

$$\frac{1}{R_x} = \frac{1}{R_B} + \frac{1}{R_C}$$

$$= \frac{1}{1.5} + \frac{1}{10}$$

$$\boxed{R_x = 1.3\,\Omega}$$

$$\therefore R_T = R_A + R_x \Rightarrow R_T = 5 + 1.3 \Rightarrow \boxed{R_T = 6.3\,\Omega}$$

$$I_T = \frac{E}{R_T} \Rightarrow I_T = \frac{20}{6.3} \Rightarrow \boxed{I_T = 3.174\,A}$$

$$V_A = I_A \cdot R_A \qquad \because [I_T = I_A]$$

$$V_A = 3.174 * 5 \qquad \therefore \boxed{V_A = 15.87}$$

$$I_B = \frac{I_T \cdot R_C}{R_B + R_C} \Rightarrow I_B = \frac{3.174 * 10}{1.5 + 10}$$

$$\therefore I_B = 2.76$$

$\therefore V_B = I_B \cdot R_B$

$$V_B = 2.76 * 1.5$$

$$\boxed{V_B = 4.14v}$$

$$I_C = \frac{I_T * R_B}{R_B + R_C} = \frac{3.174 * 1.5}{1.5 + 10}$$

$$I_C = 0.414$$

$$\therefore V_C = I_C * R_C$$

$$V_C = 0.414 * 10$$

$$\boxed{V_C = 4.14v}$$
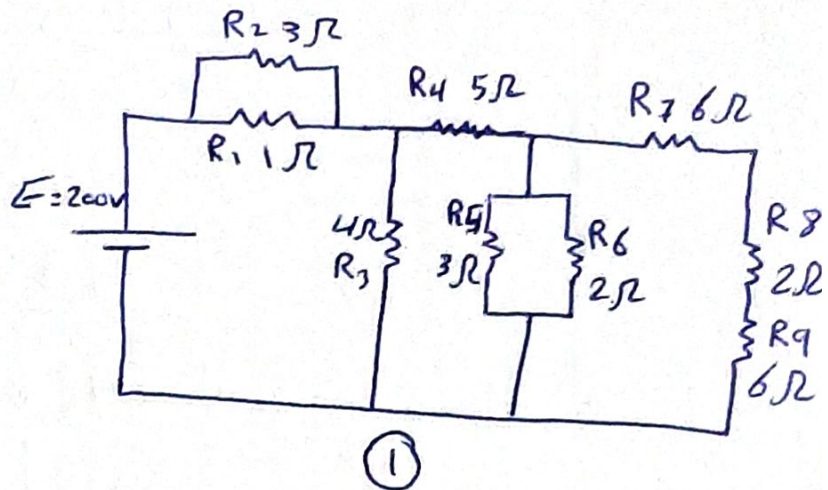
because its parallel

$$\boxed{V_B = V_C}$$

④

Ex. ~~Figur~~ For The network Shown, determine
all Current and voltages through all branches?

$$R_{1,2} = \frac{R_1 \cdot R_2}{R_1 + R_2}$$

$$= \frac{1 \times 3}{1+3} = \frac{3}{4}$$

$$\boxed{R_{1,2} = 0.75}$$

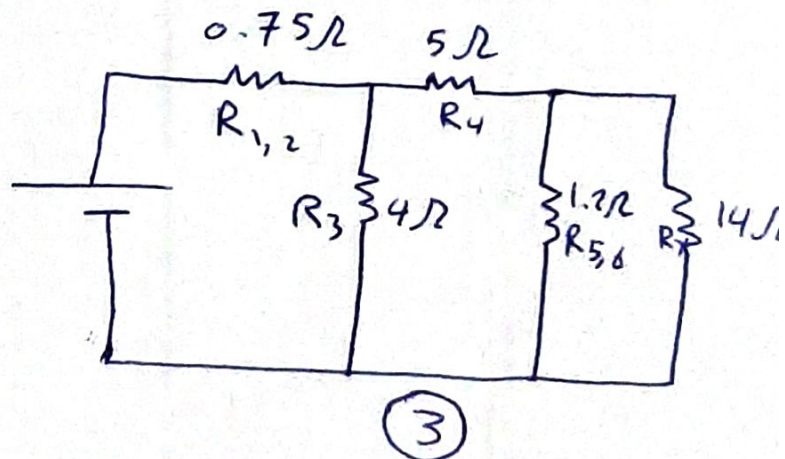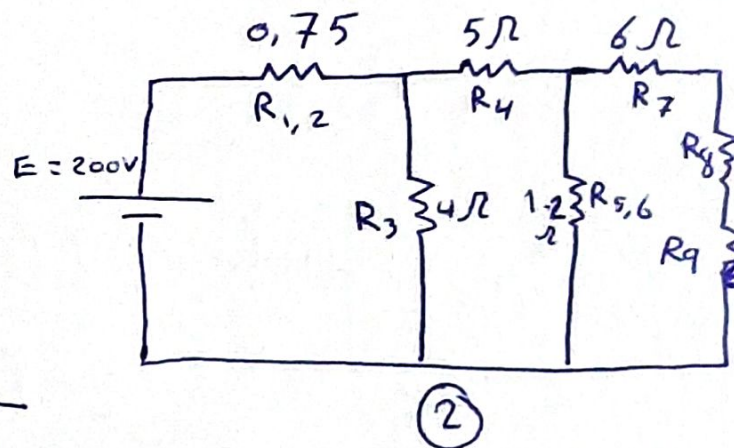$$R_{5,6} = \frac{R_5 * R_6}{R_5 + R_6} = \frac{3 * 2}{3+2} = \frac{6}{5}$$

$$\boxed{R_{5,6} = 1.2}$$

$$R_X = R_7 + R_8 + R_9$$

$$\boxed{R_X = 14\,\Omega}$$

$$R_y = \frac{R_{5,6} * R_X}{R_{5,6} + R_X} = \frac{1.2 * 14}{1.2 + 14}$$

$$\boxed{R_y = 1.1\,\Omega}$$

R₂ 3Ω, R₄ 5Ω, R₇ 6Ω
R₁ 1Ω
E = 200V
4Ω, R₅, R₆, R₈
R₃, 3Ω, 2Ω, 2Ω
R₉
6Ω
①

0.75 R₁,₂   5Ω R₄   6Ω R₇
E = 200V
R₃ 4Ω   1.2 R₅,₆   R₈
R₉
②

0.75Ω R₁,₂   5Ω R₄
R₃ 4Ω   1.2Ω R₅,₆   14Ω R₇
③

⑤

Ex₃ الحل

$$R_w = R_y + R_4$$

$$\boxed{R_w = 6.1}$$

(4)

$$R_Z = \frac{R_w \cdot R_3}{R_w + R_4}$$

$$R_Z = \frac{6.1 * 4}{6.1 + 4}$$

$$R_Z = 2.415 \, \Omega$$
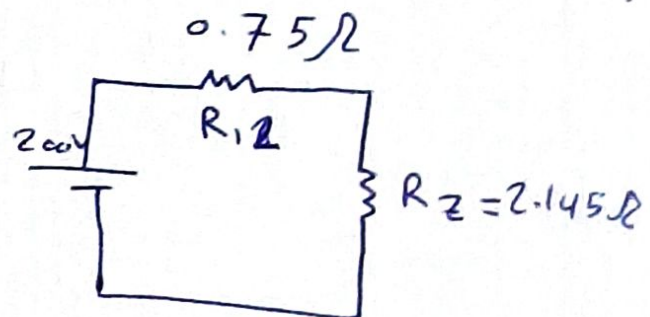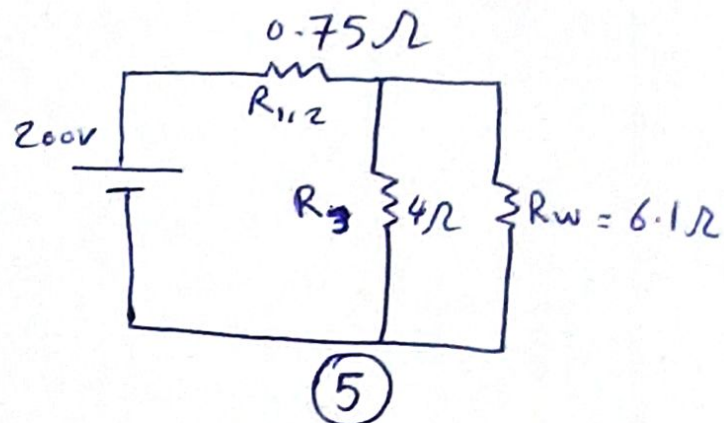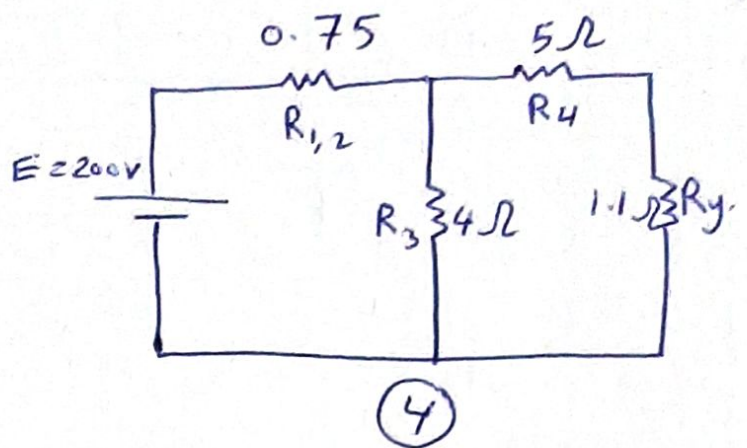

(5)

$$R_T = R_Z + R_{1,2}$$

$$= 2.145 + 0.75$$

$$\boxed{R_T = 3.165}$$

$$I_T = \frac{E}{R_T} = \frac{200}{3.165}$$

$$\boxed{I_T = 63.19 \, A}$$

$$I_T = I_{1,2} = 63.19 \, A$$

$$V_{1,2} = V_1 = V_2$$

(6)

$$V_{1,2} = I_T * R_{12} \Rightarrow V_{1,2} = 63.19 * 0.75$$

$$V_{1,2} = 47.4V = V_1 = V_2$$

Figure 4 labels: 0.75, $R_{1,2}$, 5Ω, R_4, E = 200v, R_3 4Ω, 1.1Ω R_y

Figure 5 labels: 0.75Ω, $R_{1,2}$, 200v, R_3 4Ω, $R_w = 6.1Ω$

Figure 6 labels: 0.75Ω, R_{12}, 200v, $R_Z = 2.145Ω$

Ex_3 تكملة

$$I_1 = \frac{V_1}{R} = \frac{47.4}{1}$$

$$\boxed{I_1 = 47.4_A}$$

$$I_2 = \frac{V_2}{R_2} = \frac{47.4}{3}$$

$$\boxed{I_2 = 15.8}$$