

Fluda Abu Zayed

في قناة على اليوتوب اسمها "Circuit-99"

بتشرح السيركط بطريقة رائفة اعزائي صفا

ورج تستفيدوا كثير

$$\begin{aligned}
 &V = IR \\
 &P = \frac{V^2}{R} \\
 &D = R \cdot I^2
 \end{aligned}$$

$$\begin{aligned}
 &V_2 = V_1 \frac{R_2}{R_1 + R_2} \\
 &I_2 = I_1 \frac{R_1}{R_1 + R_2} \\
 &D = I_1^2 R_1 \\
 &P = I_1^2 R_1 \\
 &V = I R
 \end{aligned}$$

Ch 1) $E_{\text{power supply}} = E_{\text{power absorbed}} p(t) = + V i$ absorbing "consume"
 + $E_{\text{power dissipated}}$ absorbed $p(t) = -V(t) i$ Supplying "deliver"

$$V = \frac{dw}{dq}$$

$$i = \frac{dq}{dt}$$

$$V = RI$$

$$P = \frac{dw}{dt} = \left(\frac{dw}{dq}\right) \cdot \left(\frac{dq}{dt}\right) = Vi$$

Active : Sources "delivering"
 Passive : R, C, L "receiving"

$$V = Ri$$

$$C = \frac{1}{R} V$$

$$= G \cdot V(\omega)$$

Siemens (S)

$$P(t) = V i$$

$$V = R i$$

$$P = \frac{V^2}{R}$$

$$P = R i^2$$

C ⇒ Farad

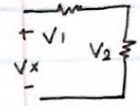
L : inductor Henry (H)

$$V I R \quad V = RI$$

$$V I C \quad i = C \frac{dV}{dt}$$

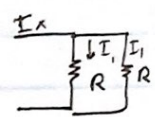
$$V I L \quad V = L \frac{di}{dt}$$

$$R_1 // R_2 \Rightarrow R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

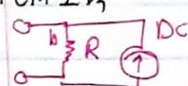
$$VDR \quad V_1 = V_x \frac{R_1}{R_1 + R_2}$$


$$V_2 = V_x \frac{R_2}{R_1 + R_2}$$

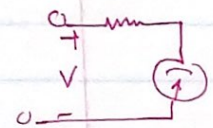
$$CDR \quad I_2 = I_x \cdot \frac{R_2}{R_1 + R_2}$$

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


DC Ammeter $R_{sh} I_{sh} = R_m I_m$

$$R_{sh} = \frac{R_m I_m}{I - I_m}$$


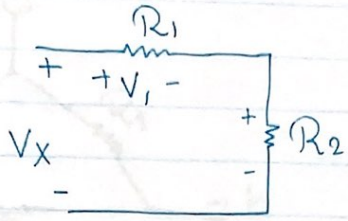
DC Volt $V = R_s I_m + R_m I_m$

$$R_s = \frac{V - R_m I_m}{I_m}$$


wheatstone $R_x = \frac{R_2 R_3}{R_1}$

$$\frac{R_1}{R_3} = \frac{R_2}{R_x}$$

VDR: V_2, V_1 و R_1, R_2, V_x يكون عندي

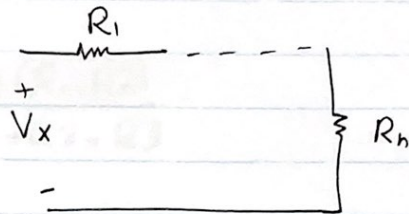


$$V_1 = \frac{R_1}{R_1 + R_2} V_x$$

$$V_2 = \frac{R_2}{R_1 + R_2} V_x$$

لعمري اعمون واود I على ال Series ل نرم اعلى Req

if you know
 V_x & R_1, \dots, R_n



$$V_1 = V_x \frac{R_1}{R_1 + R_L}$$

$$18119 = 6 \Omega$$

$$6113 = 2 \Omega$$

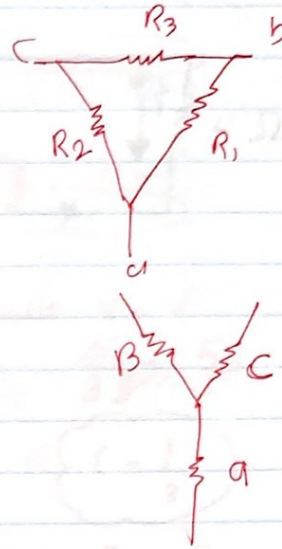
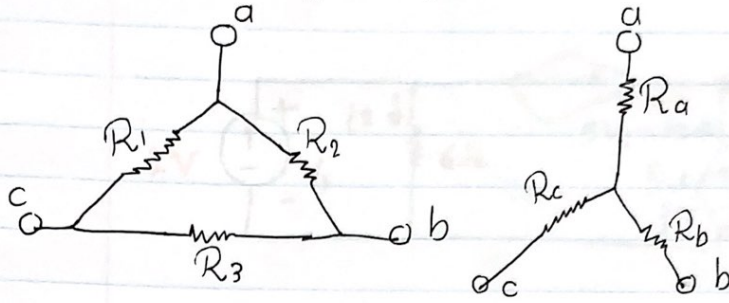
$$12116 = 4 \Omega$$

$$1214 = 3 \Omega$$

$$R_D = 3 R_Y$$

$$R_Y = \frac{1}{3} R_D$$

Delta to wye & Y to D



$$R_{ab} = R_a + R_b = \frac{R_2(R_1 + R_3)}{R_1 + R_2 + R_3}$$

$$R_{bc} = R_b + R_c = \frac{R_3(R_1 + R_2)}{R_1 + R_2 + R_3}$$

$$R_{ca} = R_c + R_a = \frac{R_1(R_2 + R_3)}{R_1 + R_2 + R_3}$$

Y → D

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

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

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

D → Y

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

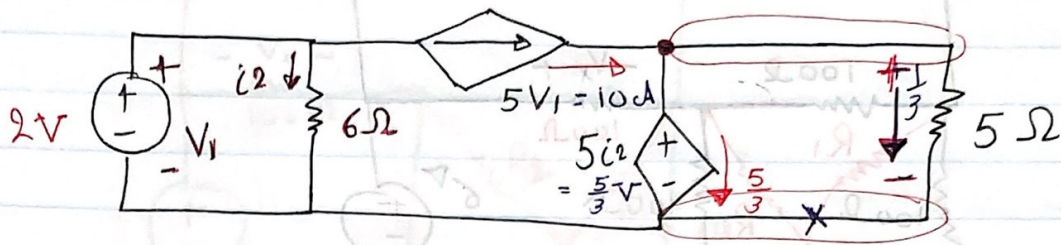
$$R_b = \frac{R_2 R_3}{R_1 + R_2 + R_3}$$

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

$$R_D = 3 R_Y$$

$$R_Y = \frac{1}{3} R_D$$

The power associated with the 5Ω resistor equals to



$$V = V$$

$$2 = 6i_2 \quad (i_2 = \frac{1}{3})$$

$$\frac{5}{3 \cdot 5} = \frac{5i}{5} \quad (i = \frac{1}{3})$$

$$P = i^2 R$$

$$5\Omega = \left(\frac{1}{3}\right)^2 \cdot 5 = 0.55 \text{ watt}$$

$$P_{\text{Voltage}} = Vi$$

parallel $V = V$

$$\frac{5}{3 \cdot 5} = \frac{5i}{5}$$

$$i = \frac{1}{3}$$

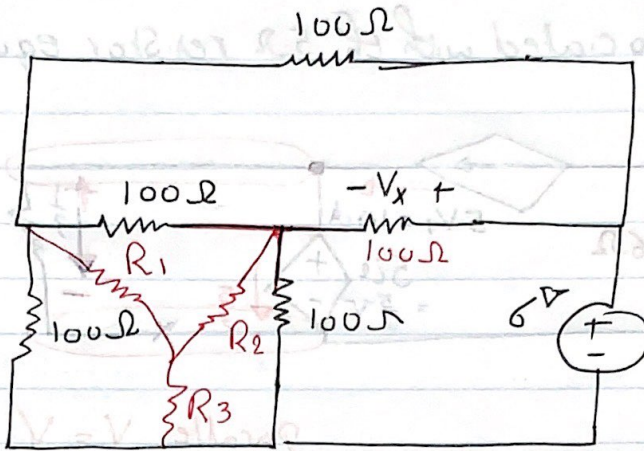
$$-\frac{5}{3} + 5$$

Apply KCL

$$10 = \frac{1}{3} + I_3$$

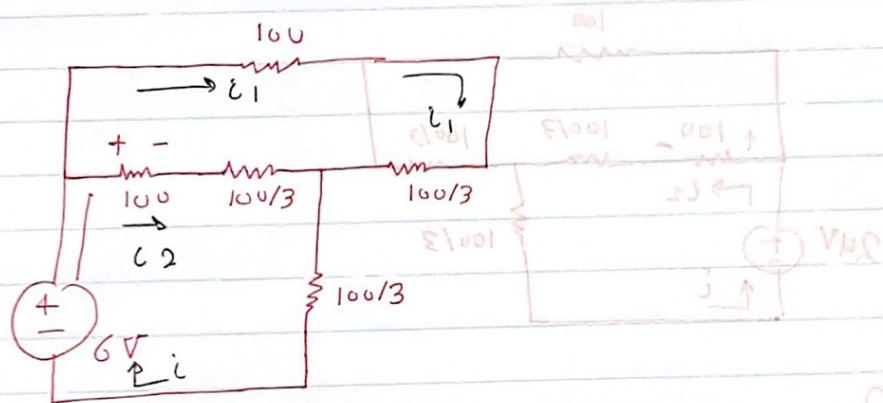
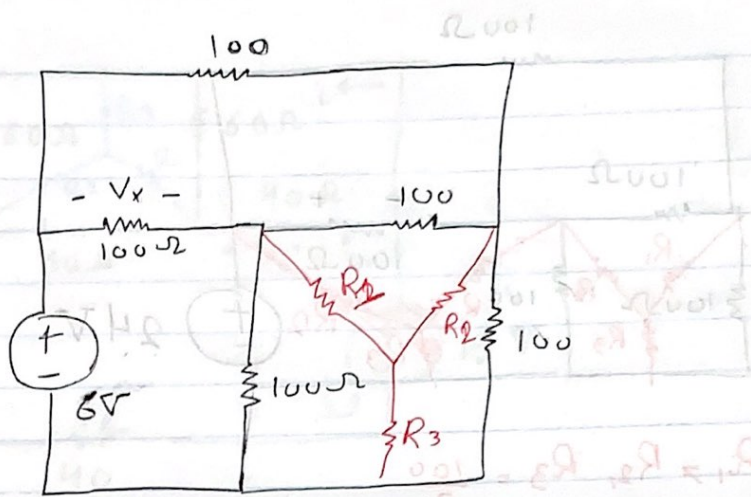
$$9.66 = I_3$$

$$P = VI_3 = \frac{5}{3} \times 9.66 = 16.11 \text{ watt}$$



$$R_D = 3R_Y$$

$$= 3 \times 100 = 300$$



$$R_{eq} = (100 + \frac{100}{3}) \parallel (100 + \frac{100}{3})$$

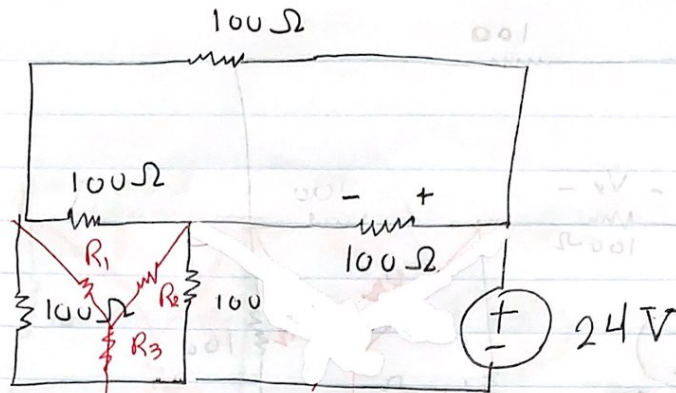
$$R_{eq} = 66.66 \Omega$$

$$i = \frac{6}{66.66} = 0.09 \text{ A}$$

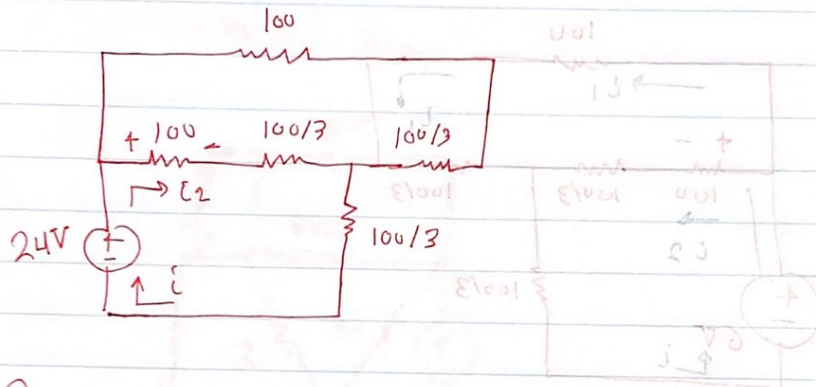
Current division Law

$$i_2 = \frac{(100 + \frac{100}{3})}{2(100 + \frac{100}{3})} \times 0.09 = 0.03 \text{ A}$$

$$V = R i = 0.03 \times 100 = 3 \text{ V}$$



$$R_1 = R_2 = R_3 = \frac{100}{3}$$



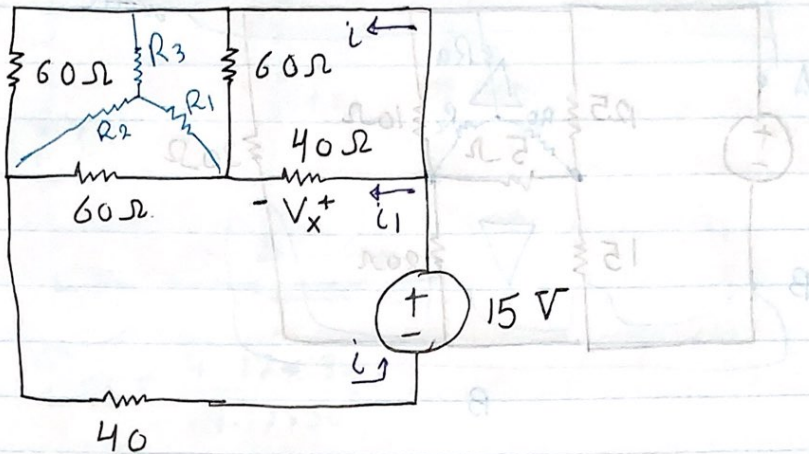
$$R_{eq} = \frac{100 + 100/3}{2} + \frac{100}{3} = 100$$

$$i = \frac{V}{R} = \frac{24}{100} = 0.24$$

$$i_2 = \frac{100 + \frac{100}{3}}{2 \left(100 + \frac{100}{3} \right)} \times 0.24 = 0.12$$

$$V = R i = 100 \times 0.12 = 12 \text{ V}$$

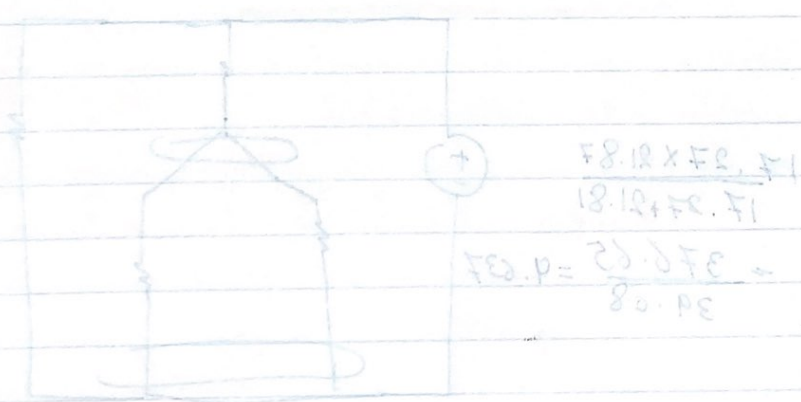
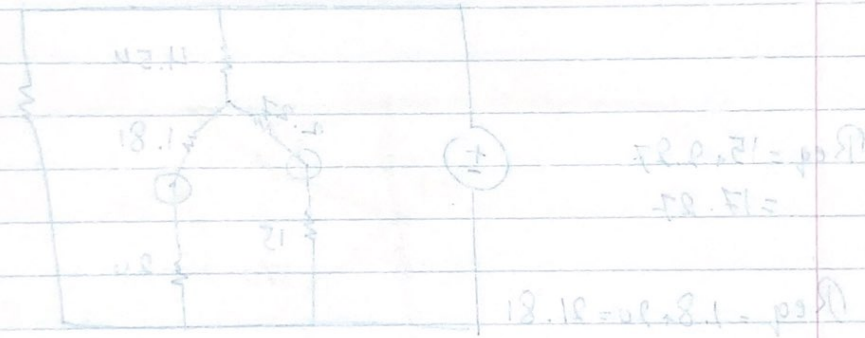
$$V = R i = 100 \times 0.12 = 12 \text{ V}$$

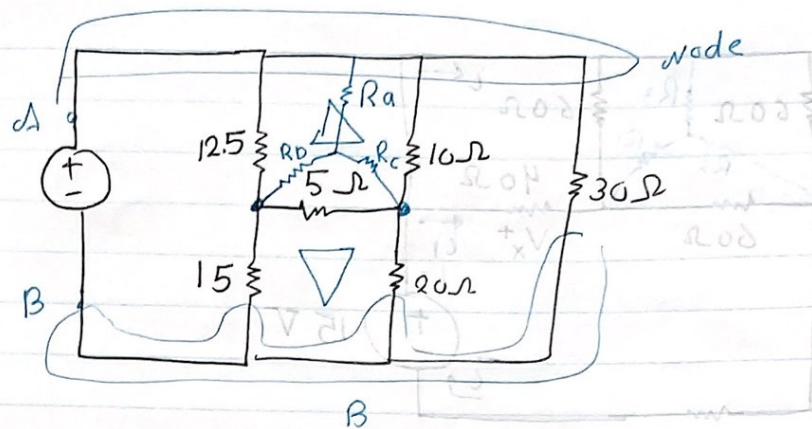


$$R_p = \frac{15 \cdot 2 + 10}{15 \cdot 2 + 10 + 2} = 4.24$$

$$R_p = \frac{15 \cdot 2}{15 \cdot 2 + 10 + 2} = 1.81$$

$$R_c = 1.81$$





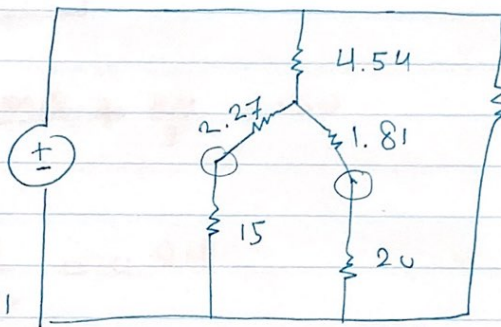
$$R_a = \frac{12.5 \times 10}{12.5 + 10 + 5} = 4.54$$

$$R_b = \frac{(12.5)(5)}{12.5 + 10 + 5} = 2.27$$

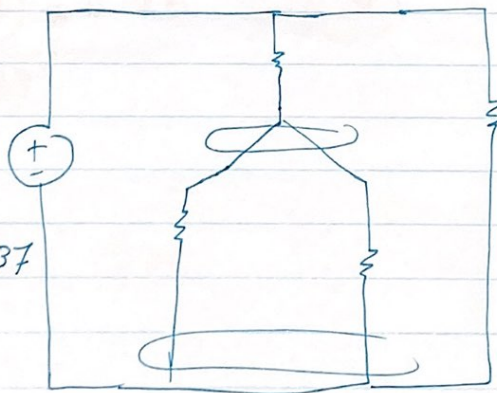
$$R_c = 1.81$$

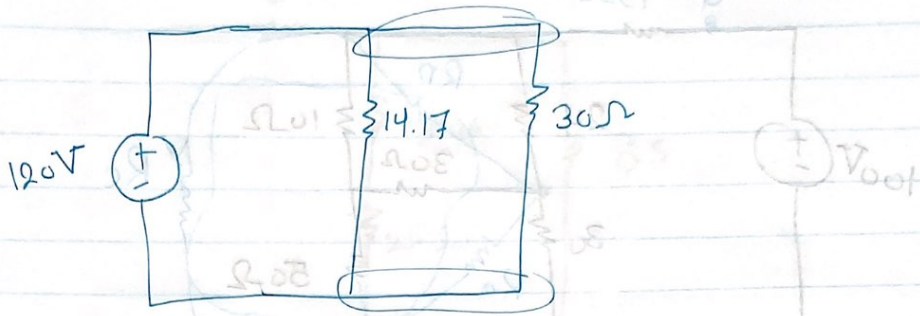
$$R_{eq} = 15 + 2.27 = 17.27$$

$$R_{eq} = 1.8 + 20 = 21.81$$



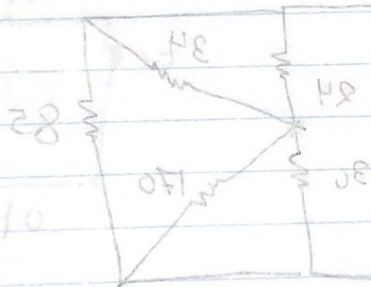
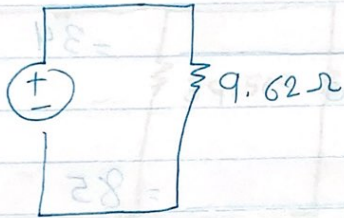
$$\frac{17.27 \times 21.81}{17.27 + 21.81} = \frac{376.65}{39.08} = 9.637$$





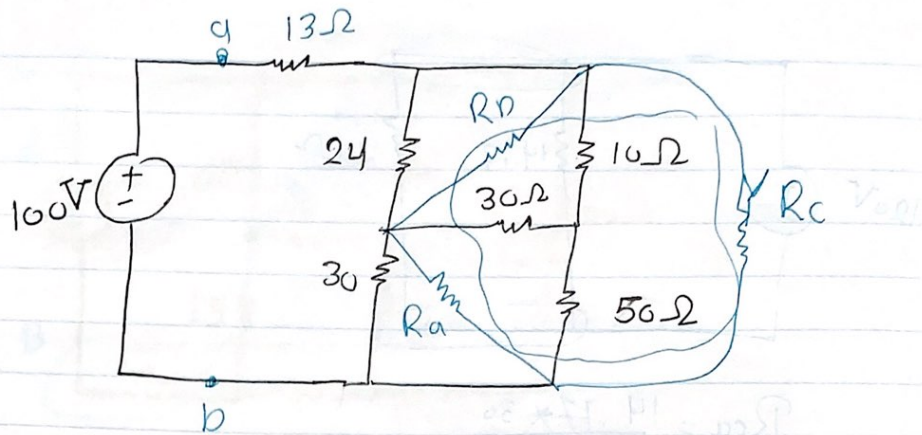
$$R_{eq} = \frac{14.17 \times 30}{14.17 + 30}$$

$$R_{eq} = 9.62 \Omega$$



$$V = \frac{100}{40} = 2.5$$

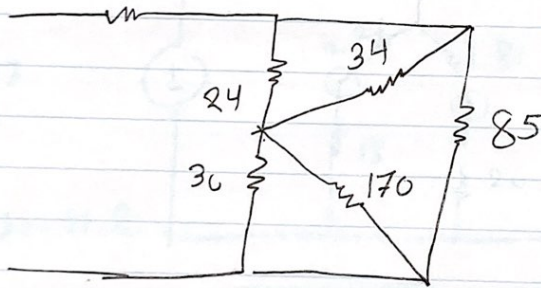
$$30 \parallel 150 = 22.5 \Omega$$



$$R_a = \frac{(10 \times 50) + (50 \times 20) + (10 \times 20)}{10} = 170 \Omega$$

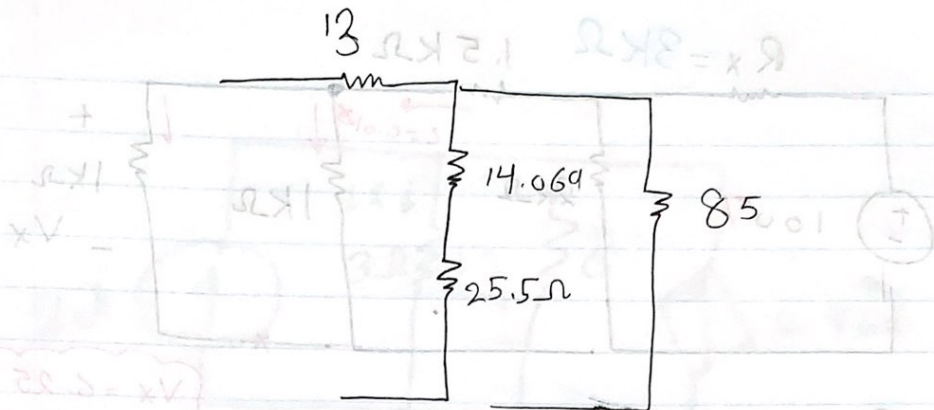
$$R_b = \frac{30 \times 170}{30 + 170} = 34$$

$$R_c = \frac{24 \times 34}{24 + 34} = 14.669 \Omega$$

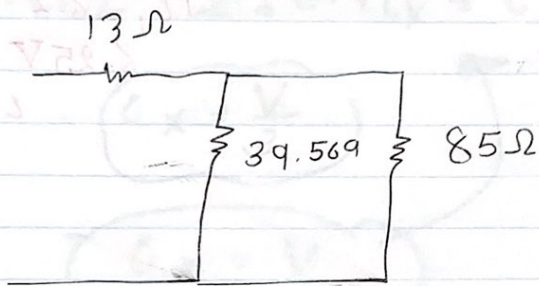


$$24 \parallel 34 = 14.669 \Omega$$

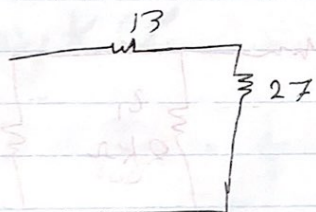
$$30 \parallel 170 = 25.50$$



$$14.069 + 25.5 = 39.569$$



$$39.569 \parallel 85 = 27$$



$$13 + 27 = 40$$

$$C = \frac{V}{R} = \frac{100}{40} = 2.5$$

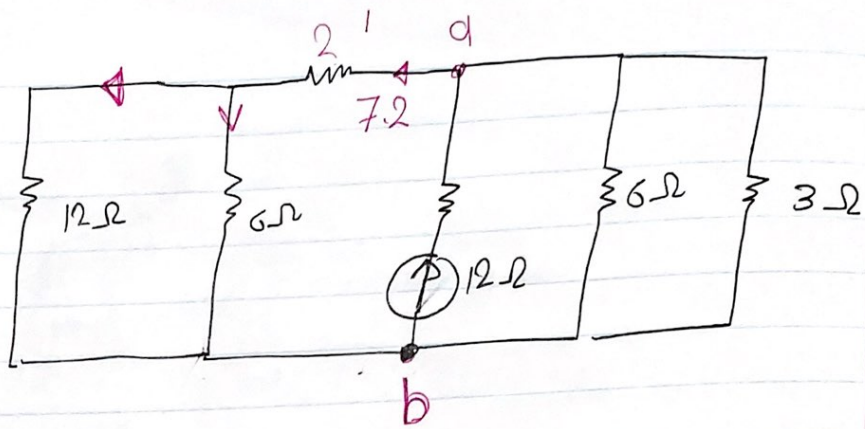
$$i = \frac{100}{40} = 2.5$$

$$\frac{1}{R} + \frac{1}{R} = \frac{1}{R_{eq}}$$

$$\frac{1}{R} + \frac{1}{R} = \frac{2}{R}$$

$$\frac{1}{R} + \frac{1}{R} = \frac{2}{R}$$

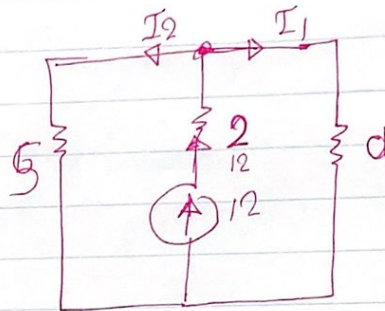
$$\frac{1}{R} = \frac{2}{R}$$



$$6 \parallel 3 = 2$$

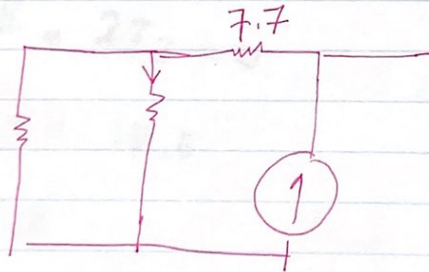
$$12 \parallel 6 = 4$$

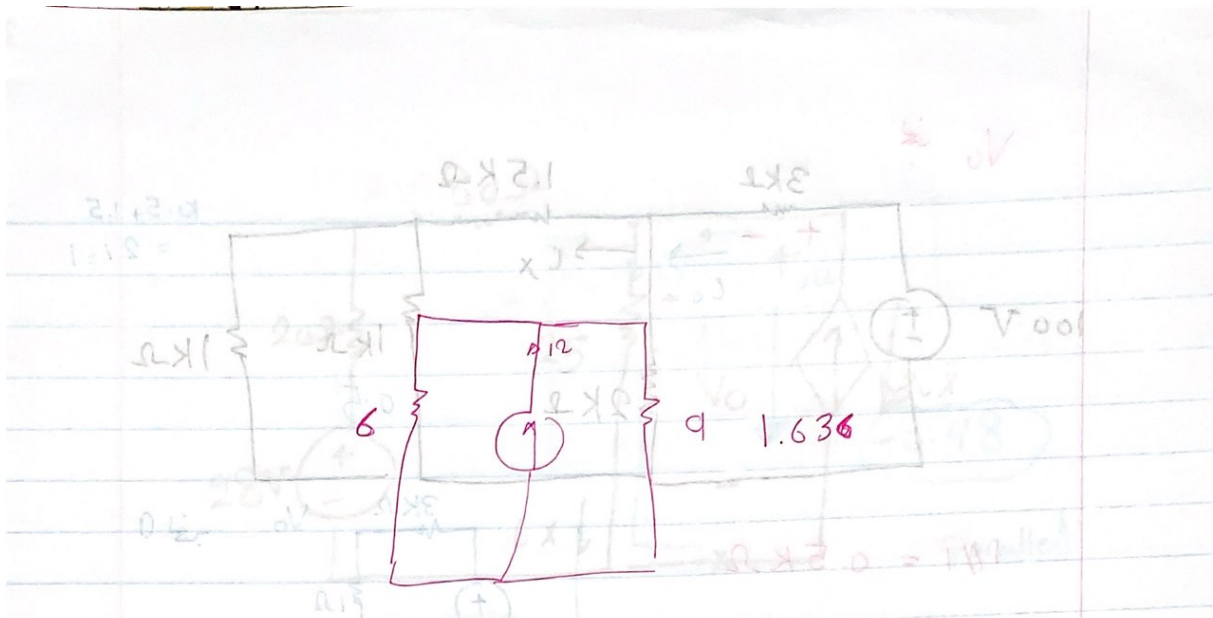
$$4 + 2 = 6$$



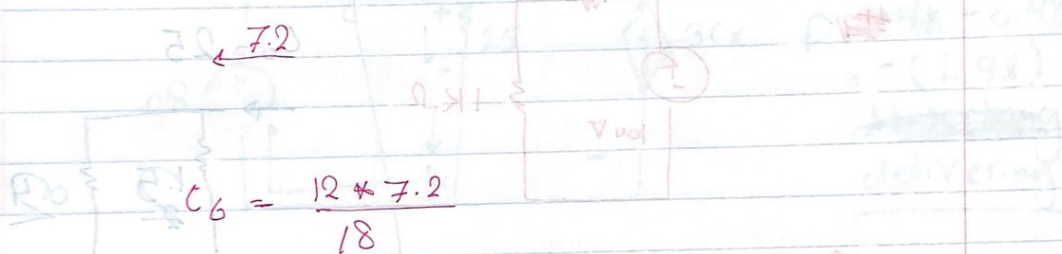
$$I_2 = -12 \frac{9}{15} = \boxed{7.2} \quad 6.35$$

$$I_6 = 7.2 * \frac{12}{18} = \boxed{4 \text{ A}}$$



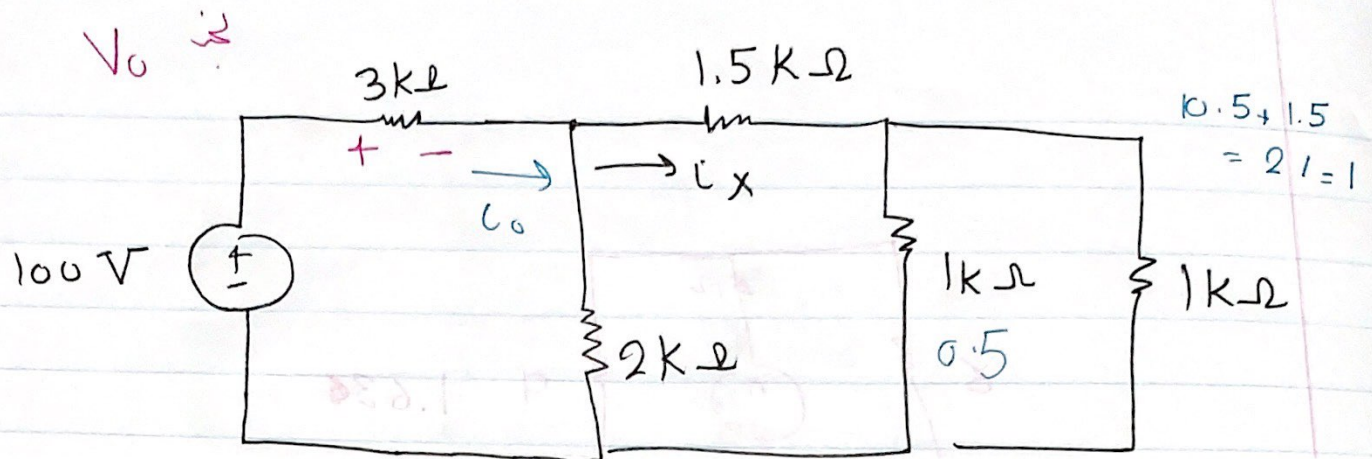


Find $i_6 = \frac{12 * 9}{15} = 7.2$



$i_6 = \frac{12 * 7.2}{18} = 2.57$

$2.57 = 2.57 * \frac{12}{18}$



100 V

V_0

3k Ω

1.5k Ω

+ - I_0

I_x

$$0.5 + 1.5 = 2 / = 1$$

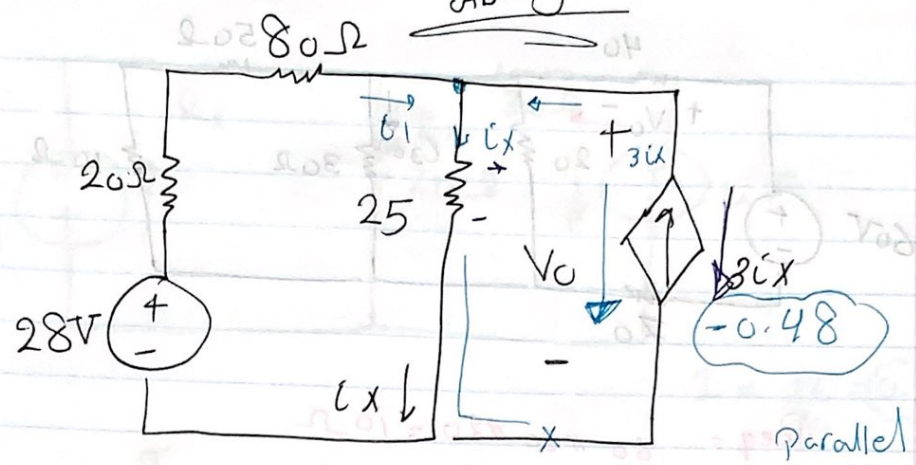
2k Ω

1k Ω

0.5

1k Ω

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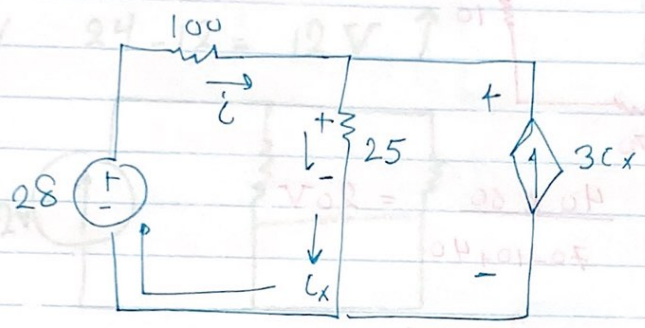


Find P_{3ix}

$$V_o = 25i_x$$

$$= 25 \times -0.16$$

$$= -4$$



$$P = -4 \times -0.48$$

$$= -(1.92)$$

delivering

Applying KVL $-28 - 100i + 25i_x = 0$

Applying KCL

$$3i_x = i_1 + i_x$$

$$-i_x = -i_x$$

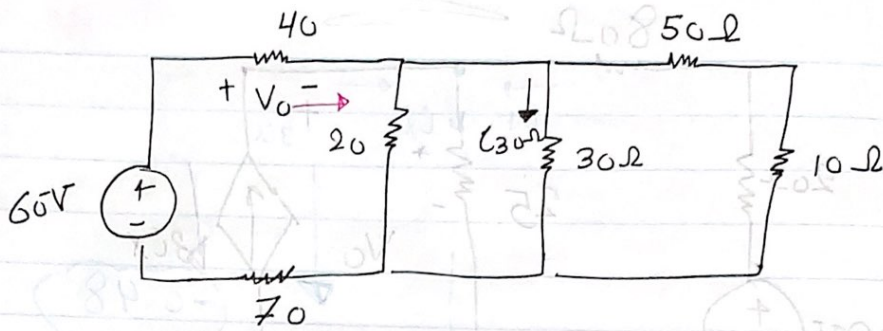
$-2i_x = i_1$

$$-28 - 200i_x + 25i_x = 0$$

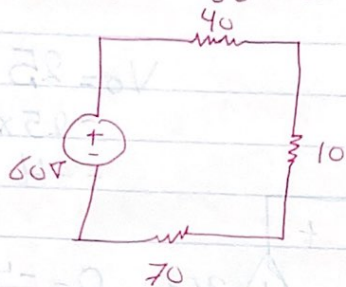
$$28 = -175i_x$$

$$i_x = -0.16$$

Applying KVL



$$R_{eq} = 60 \parallel 30 \parallel 20 = 10 \Omega$$



$$V_0 = \frac{40 \times 60}{70 + 10 + 40} = 20V$$

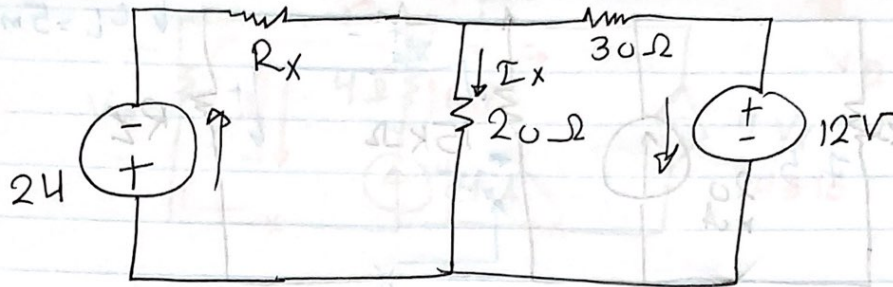
The current through 40

$$i = \frac{V_0}{40} = \frac{20}{40} = 0.5A$$

to use Current division Rule we find the equivalent resistance parallel to 30 contains 20

$$60 \parallel 20 = \frac{20 \times 60}{20 + 60} = 15$$

$$i_{30} = 0.5 \times \frac{15}{45} = 0.1667$$



$$I = \frac{12}{30} = 0.4$$

$$I_x = \text{Zero}$$

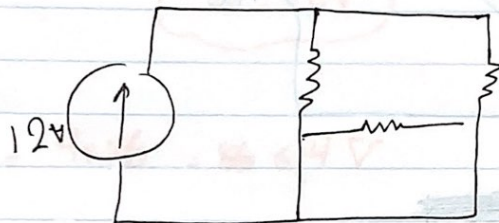
$$V = RI$$

$$V = 24 - 12 = 12V \uparrow$$

$$12 \Rightarrow 30$$

$$24 \Rightarrow 60$$

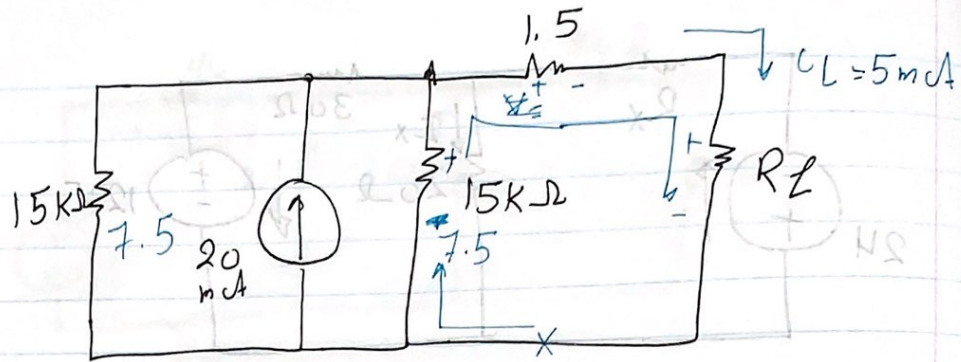
$$60\Omega$$



the same potential

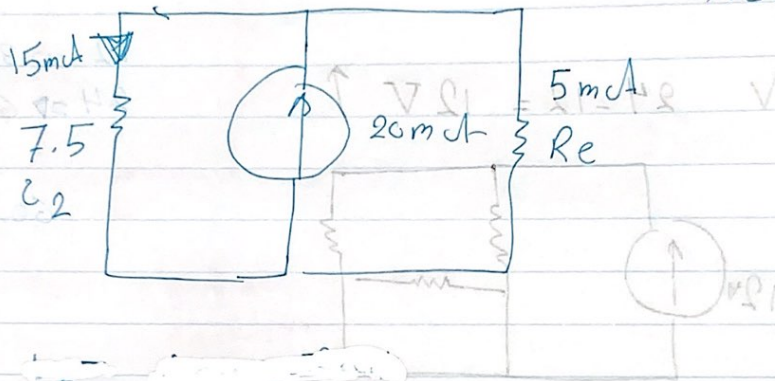
$$\frac{I}{R_x} = \frac{30}{12} I$$

$$2.5R_x = 24$$



$R_L = ?$ if $i_L = 5\text{mA}$

$$R_e = 1.5 + R_L$$



$20\text{k}\Omega$

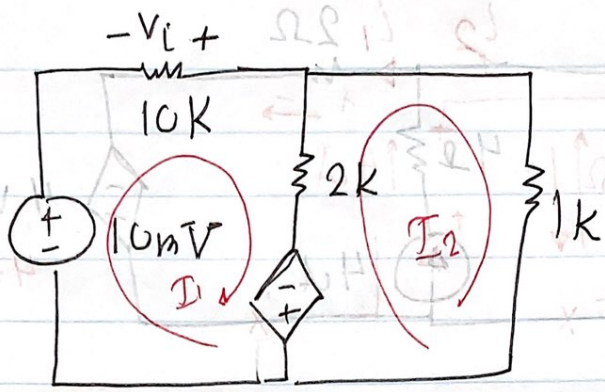
$$-7.5 * 15 + 1.5 * 5\text{mA} + 5 R_L = 0$$

$$120 = 5 R_L$$

$$-105 = 5 R_L$$

$$R_L = 21$$

$2V + 0.1A \cdot 10K = 0$
 $2V - 1V = 0$
 $1V = 0$



$0 = 0.1 + 0.2 \cdot 0 -$
 $10mV - I_1 \cdot 10K - (I_1 - I_2) \cdot 2K + 10Vi = 0$
 $Vi = -\frac{I_1}{10K}$

$-Vx = 10V$

$Nx = 10V = 10 \cdot 10^{-3} = 0.1V$

$0 = 10 + 10 + 0 + 0 = 0$

$0.1 = 0.1$

$I_1 = 0$

$250 - 110 = 140$

$0 = 10V$