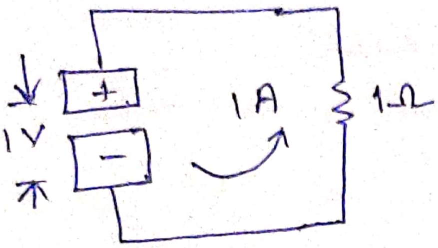
ESP

potenial means difference



Electron always move from -ve side +ve side
→ movement of electron is nothing but "current"
→ current always flows opposite direction to the flow of $\bar{e}$

initially voltage find
↓
current
↓
Resistance

initially they found relation as

$$R = \frac{V}{I}$$

power is rate
Energy is integral

V → Generation → voltage (V)
I → Transmission → current (A)
R → utilization → Resistance (Ω)
P → power /sec → power (W)
E → cummulative ~~Energy~~ power → Energy (W/s)

→ we feel the effect of current not voltage
(or)
shock due to the current not by voltage

Rating = No of $\bar{e}$ / sec

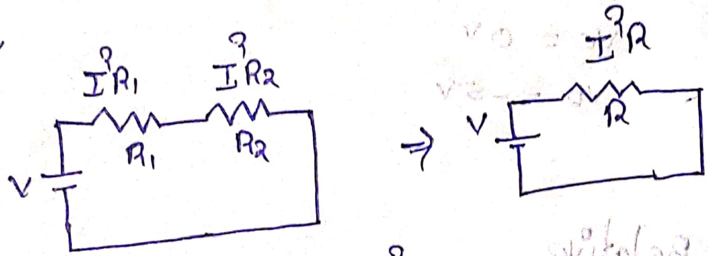
$P = I^2 R$

$= I . I . R$

$\boxed{P = I V}$

→ wire burns when more current flows through it i.e greater than it's rating

Let,

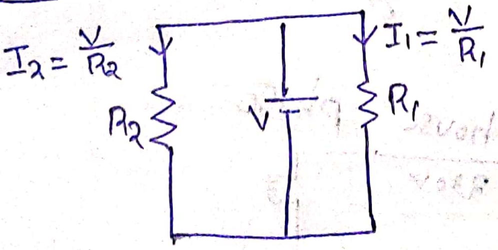


$I^2R = I^2R_1 + I^2R_2$

$\cancel{I^2}R = \cancel{I^2}(R_1 + R_2)$

$\therefore \boxed{R = R_1 + R_2}$

Let



W.K.T
total power = sum of individual powers

$\frac{V^2}{R} = \frac{V^2}{R_1} + \frac{V^2}{R_2} \Rightarrow \frac{\cancel{V^2}}{R} = \cancel{V^2}\left(\frac{1}{R_1} + \frac{1}{R_2}\right)$

$\Rightarrow \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$

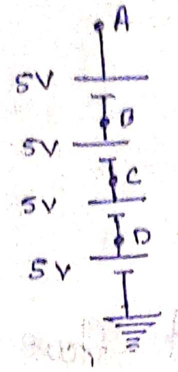
$\boxed{R = \frac{R_1 R_2}{R_1 + R_2}}$

Scanned with OKEN Scanner

Zero × Anything = 0

Zero × ∞ ≠ 0 (indeterminent)

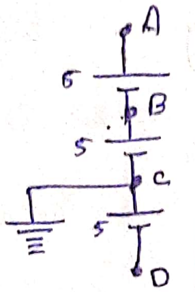
Let,



$V_{AD} = 20\,V$

$V_{BD} = 15\,V$

"



$V_A = 10\,V$

$V_B = 5\,V$

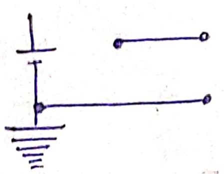
$V_C = 0\,V$

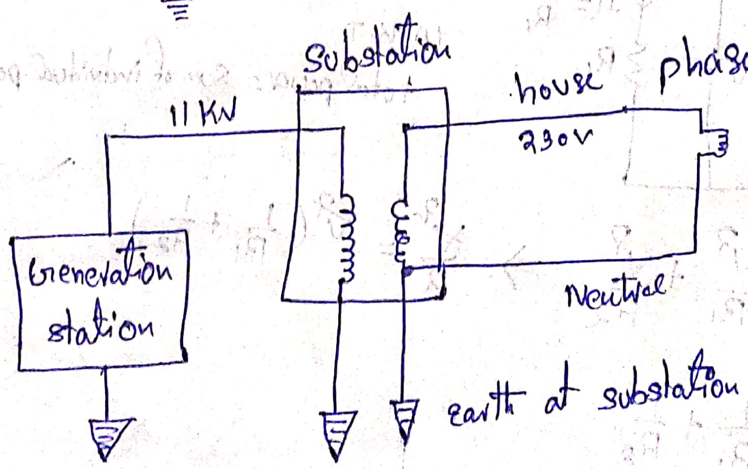
$V_D = -5\,V$

Ground → Relative

Earth → Absolute (always 0V)

Let





Ground → common point

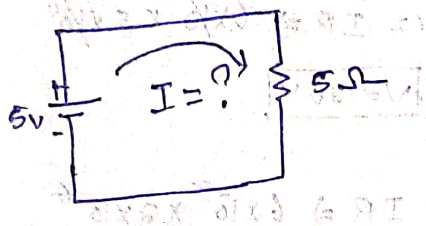
Earth → Absolute zero voltage

zero voltage → connected to common point

No voltage → not connected to anything

−ve voltage → measure with common point

Electrical Fundamentals

① 

Sol W.K.T

$V = IR$

$I = \frac{V}{R} = \frac{\cancel{5}}{\cancel{5}} = 1$

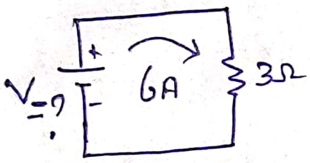
$\boxed{I = 1A}$

② 

Sol W.K.T

$R = \frac{V}{I} = \frac{\cancel{20}^{4}}{\cancel{5}} =$

$\boxed{R = 4\Omega}$

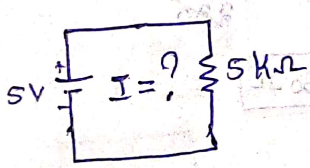
③ 

Sol W.K.T

$I = \frac{V}{R} =$

$V = IR \Rightarrow 6 \times 3 = 18$

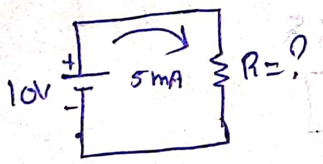
$\boxed{V = 18V}$

④ 

Sol W.K.T

$I = \frac{V}{R} = \frac{\cancel{5}^{1}}{\cancel{5} \times 10^{3}}$

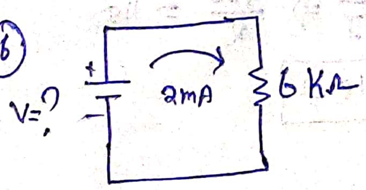
$\boxed{I = 1 mA}$

⑤ 

Sol W.K.T

$R = \frac{V}{I} = \frac{10^{2}}{\cancel{5} \times 10^{-3}}$

$\boxed{R = 2K\Omega}$

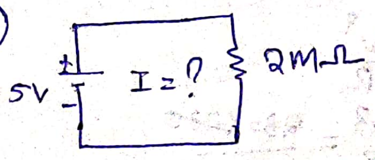
⑥ 

Sol W.K.T

$V = IR$

$= 2 \times \cancel{10}^{-3} \times 6 \times \cancel{10}^{3}$

$\boxed{V = 12V}$

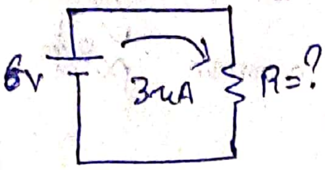
⑦ 

Sol W.K.T

$I = \frac{V}{R} = \frac{5}{2 \times 10^{6}}$

$\boxed{I = 2.5 \mu A}$

(8)

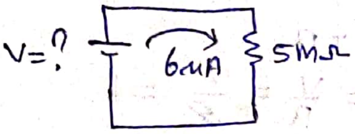


Sol W.K.T

$R = \frac{V}{I} \Rightarrow \frac{\cancel{6}\,2}{\cancel{3}\times10^{-6}}$

$\boxed{R = 2\,M\Omega}$

(9)

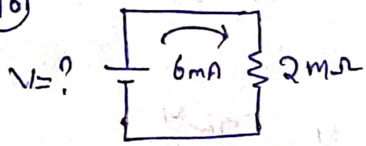


Sol W.K.T

$V = IR \Rightarrow 6\times\cancel{10^{-6}} \times 5\times\cancel{10^{6}}$

$\boxed{V = 30\,V}$

(10)



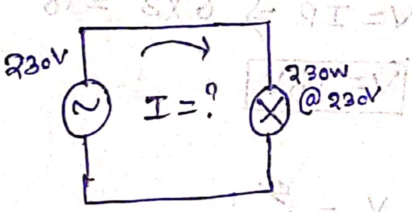
Sol $V = IR \Rightarrow 6\times10^{-3} \times 2\times10^{6}$

$\boxed{V = 12\,KV}$

---

power law assessment

(1)



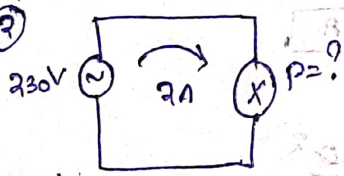
Sol W.K.T

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

$R = \frac{V^2}{P} = \frac{230\times\cancel{230}}{\cancel{230}}$

$\boxed{R = 230\,\Omega}$

(2)



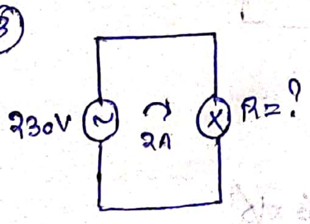
Sol W.K.T

$P = VI$

$= 230 \times 2$

$\boxed{P = 460W}$

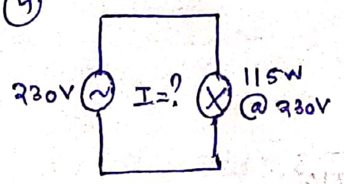
(3)



Sol W.K.T $R = \frac{V}{I} \Rightarrow \frac{230}{2} = 115$

$\boxed{R = 115\,\Omega}$

(4)



Sol To find I we need to find R

W.K.T $P = \frac{V^2}{R}$

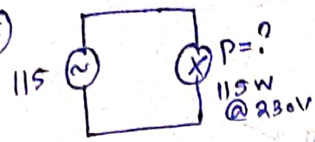
$R = \frac{V^2}{P} = \frac{230\times\cancel{230}^{\,2}}{\cancel{115}}$

$R = 460\,\Omega$

$I = \frac{V}{R} \Rightarrow \frac{\cancel{230}}{\cancel{460}_2} = 0.5$

$\boxed{I = 0.5A}$

⑤



Sol To find P first need to find R

$R = \frac{V^2}{P} = \frac{230 \times 230 \; 2}{\cancel{115}}$

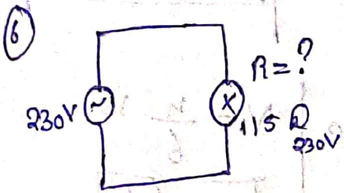
$R = 460\Omega$

$I = \frac{V}{R} = \frac{115}{460} = 0.25$

$P = VI \Rightarrow 115 \times 0.25 \Rightarrow 28.75$

$\boxed{P = 28.75W}$

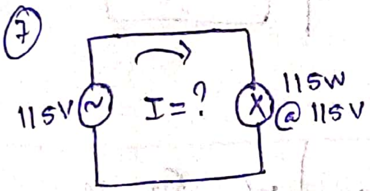
⑥



Sol above W.K.T

$\boxed{R = 460\Omega}$

⑦



Sol To find I we need to find R

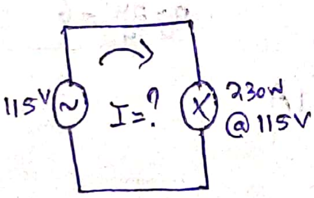
$R = \frac{V^2}{P} = \frac{115 \times \cancel{115}}{\cancel{115}} = 115$

$R = 115$

$I = \frac{V}{R} \Rightarrow \frac{\cancel{115}}{\cancel{115}} = 1$

$\boxed{I = 1A}$

⑧



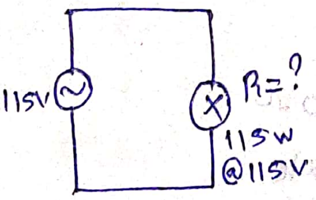
Sol To find I, we need to find R

$R = \frac{V^2}{P} \Rightarrow \frac{115 \times \cancel{115}}{\cancel{230}_2} = 57.5$

$I = \frac{V}{R} \Rightarrow \frac{115}{57.5}$

$\boxed{I = 2A}$

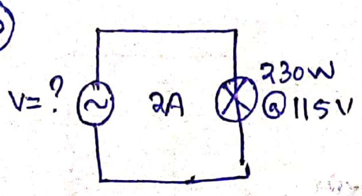
⑨



Sol $R = \frac{V^2}{P} \Rightarrow \frac{115 \times \cancel{115}}{\cancel{115}}$

$\boxed{R = 115\Omega}$

⑩



Sol To Find V, First find R

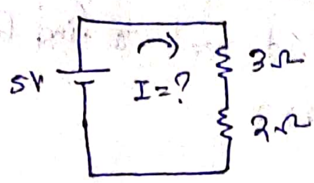
$R = \frac{V^2}{P} = \frac{115 \times \cancel{115}}{\cancel{230}_2} = 57.5$

$V = IR \Rightarrow 2 \times 57.5$

$\boxed{V = 115V}$

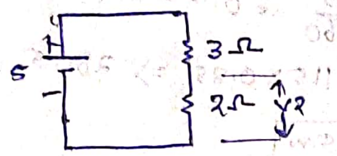
Series circuit Assessment

(1)



sol To find I,
find R
$R = 3\Omega + 2\Omega$
$R = 5\Omega$
$I = \frac{V}{R} \Rightarrow \frac{5}{5}$ 1 A

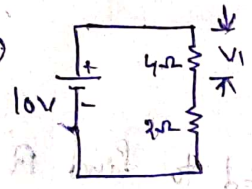
(2)



sol To find V2
voltage divider rule
$\cancel{V_2 = \frac{3}{(3+2)}}$ 5
$\boxed{\cancel{V_2 = 2V}}$

$V_2 = \frac{2}{2+3}$ ~~5~~
$\boxed{V_2 = 2V}$

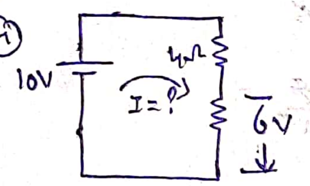
(3)



sol To find V1,
voltage divider rule
$\cancel{V_1 = \frac{2}{6} 10}$
$\boxed{\cancel{V_1 = 3.33}}$

$V_1 = \frac{4}{6}$ 10
$\boxed{V_1 = 6.6}$

(4)

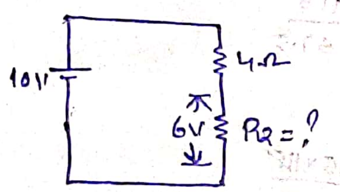


sol To find I,
Find Total R,
$\cancel{R_2\ V_1 = \frac{4}{(4+R)}}$ 10
$\cancel{(4+R) = \frac{4}{6}}$ 10

$R_2 = \frac{R_2}{(R_2+4)}$ 10
$6R_2 + 24 = 10R_2$
$24 = 4R_2$
$R_2 = \frac{24}{4} = 6$

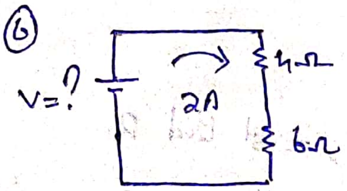
$R = 6 + 4 \Rightarrow 10$
$I = \frac{V}{R} = \frac{10}{10} = 1A$
$\boxed{I = 1A}$

(5)



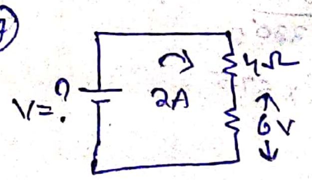
sol To find R2
voltage divider rule above
$\boxed{R = 6\Omega}$

(6)



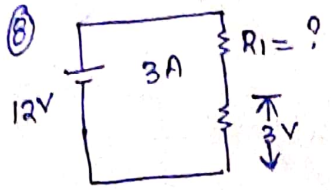
sol $R = 4+6 \Rightarrow 10\Omega$
$V = IR \Rightarrow 2 \times 10$
$\boxed{V = 20V}$

(7)



sol To find V
W.K.T.
$I = 2$
$V_1 = I_1 \times R_1$
$V_1 = 2 \times 4 = 8$
$V = V_1 + V_2$

(8)



sol

W.K.T $V = V_1 + V_2$

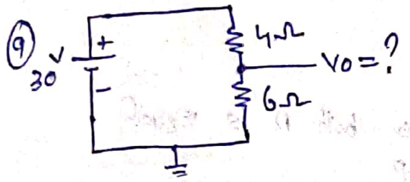
$12 = V_1 + 3$

$V_1 = 12 - 3 \Rightarrow 9$

By ohm's law

$R = \frac{V}{I} \Rightarrow \frac{\cancel{9}\,3}{\cancel{3}} = 3\Omega$

(9)



sol To find Vo

find I, $I = \frac{V}{R} = \frac{30}{10} = 3$

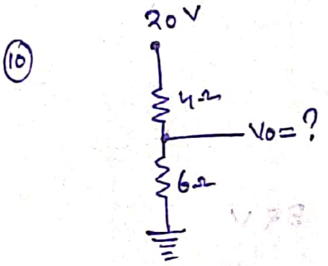
$V_1 = IR \Rightarrow 3 \times 4 = 12$

$V_0 = V - V_1$

$= 30 - 12$

$\boxed{V_0 = 18V}$

(10)



sol To find Vo

Find I, $I = \frac{V}{R} = \frac{20}{10} = 2$

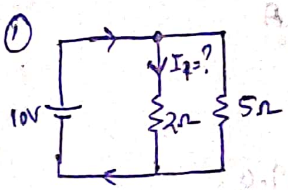
$V_1 = 2 \times 4 = 8V$

$V_0 = 20V - V_1 \Rightarrow 20 - 8$

$\boxed{V_0 = 12V}$

parallel circuit assessment

(1)

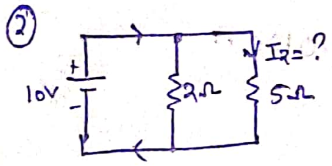


sol To find I_2

W.K.T at Node $V = 10V$

$I_2 = \frac{V}{R} = \frac{10}{2} = 5A \Rightarrow \boxed{I = 5A}$

(2)

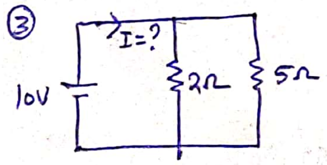


sol To find I_2

W.K.T at Node $V = 10V$

$I_2 = \frac{V}{R} = \frac{10}{5} = 2 \Rightarrow \boxed{I_2 = 2A}$

(3)



sol

W.K.T

$I = I_1 + I_2$

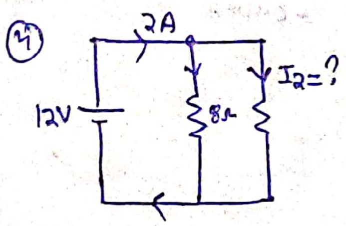
$= 5A + 2A$

$I = 7A$

(or)

$I = \frac{V}{R} = \frac{10}{1.42} = 7$

(4)



sol at Node $V = 12$

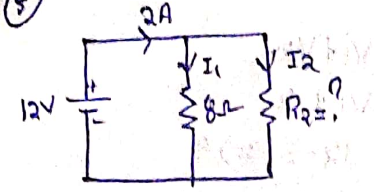
$I_1 = \frac{12}{8} = 1.5$

$I = I_1 + I_2$

$I_2 = I - I_1 \Rightarrow 2 - 1.5$

$\boxed{I_2 = 0.5A}$

(5)



Sol To find R_2

find I_2, I_1

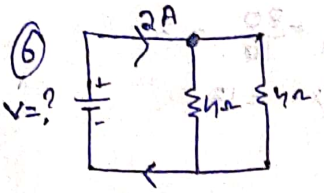
$I_1 = \frac{V}{R} = \frac{12}{8}$ 1.5

$I_2 = I - I_1$

$I_2 = 2 - 1.5 = 0.5$

$R_2 = \frac{V}{I_2} = \frac{12}{0.5} = 24\Omega$

(6)



Sol To find V.

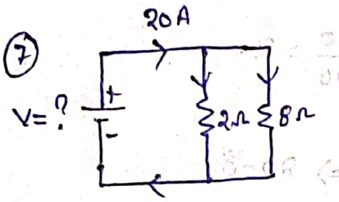
Find R

Tip: in parallel when both R is equal then $R_{eq} = \frac{R}{2}$

$\therefore R = 2\Omega$

$V = IR \Rightarrow 2 \times 2 = 4V$

(7)



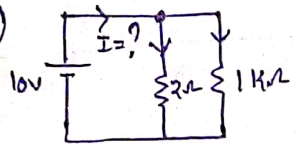
Sol To Find V

Find R

$R = \frac{8 \times 2}{8+2} = 1.6$

$V = I.R \Rightarrow 20 \times 1.6 \Rightarrow 32V$

(8)



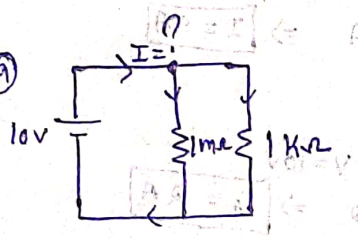
Sol To find I

Find R

$R = \frac{2 \times 1k}{2+1k} = 1.9960$

$I = \frac{V}{R} = \frac{10}{1.9960} = 5.01A$

(9)



Sol To find I

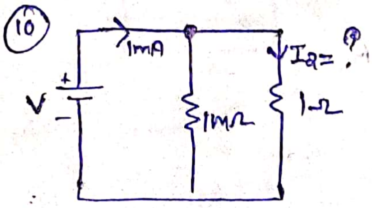
Find R, $R = \frac{1m \times 1k}{1m+1k} = 999.0$

$I = \frac{V}{R} = \frac{10}{999.0} = 0.0100 A$

or

$\boxed{I = 10.01 mA}$

(10)



Sol To find I_2

find V, R

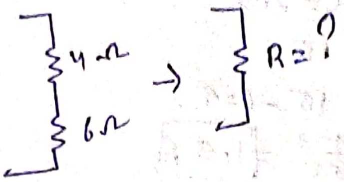
$R = \frac{1M \times 1}{1M+1} = 0.9999$

$V = IR \Rightarrow 1m \times 0.999$

$V = 0.9 mV$

$I_2 = \frac{V}{R} = \frac{0.9m}{1} = 0.9mA$

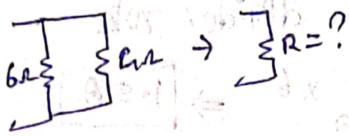
Series- parallel ckt Assessment

① 

sol

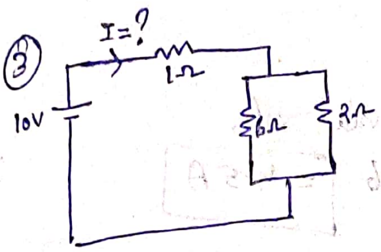
$R = 4+6$

$R = 10\,\Omega$

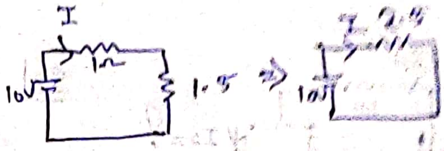
② 

sol

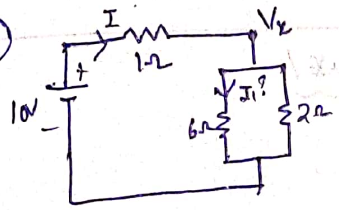
$R = \frac{6\times4}{6+4} \Rightarrow 2.4\,\Omega$

③ 

sol



$I = \frac{10}{2.5} \Rightarrow 4A$

④ 

sol To find I_1

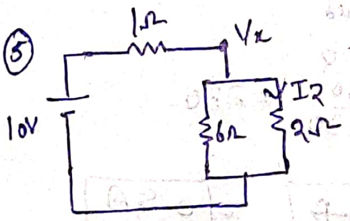
above w.k.T $I = 4A$

Voltage drop across 1Ω

$V = 4\times1 = 4$

$V_x = 10-4 = 6V$

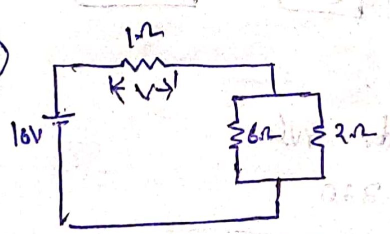
$I_1 = \frac{V}{R} = \frac{6}{6} = 1A$, $\boxed{I_1 = 1A}$

⑤ 

sol To find I_2

w.k.T $V_x = 6V$

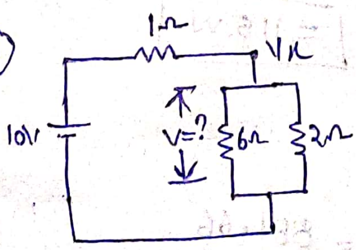
$I_2 = \frac{V_x}{2} = \frac{6}{2} = 3A$

⑥ 

sol w.k.T $I_{Total} = 4A$

$V_1 = IR$

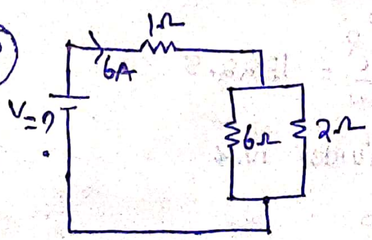
$\boxed{V_1 = 4\times1 = 4V}$

⑦ 

sol w.k.T at $V_x = 6V$

due to parall connection voltag is same

$\boxed{V = 6V}$

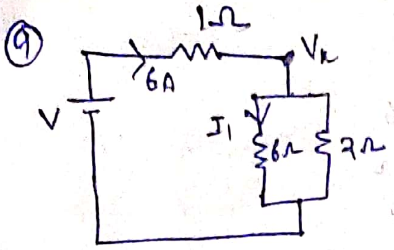
⑧ 

sol To Find V_s

w.k.T above $R_T = 2.5$

$V = 6\times2.5$

$\boxed{V = 15\,V}$

⑨


Sol To Find I_1

Find V_{Total}, V_x, R_T

W.K.T $R_T = 2.5$

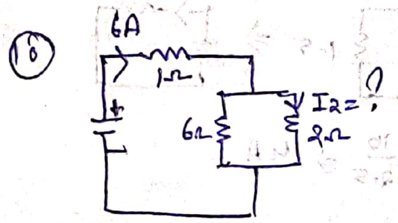
$V_T = 15$

$V_x = 15 - 6 = 9$

$I_1 = \frac{9}{6} = \boxed{1.5A}$

(or) use current divider rule

$I_1 = \frac{2}{6+2} \times 6 \Rightarrow \boxed{1.5A}$

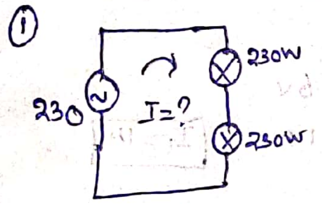
⑩


Sol To Find I_2

By current divider rule

$I_2 = \frac{6}{6+2} \times 6 \; \boxed{= 4.5A}$

Series circuit with power

①


Sol To find I.

Find R_{Total}

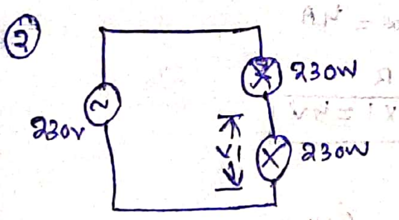
if voltage not given mentioned to the load

assume as 230V

$R_1 = R_2 = \frac{V^2}{P} = \frac{230^2}{230} = 230.$

$R_T = 460$

$I = \frac{V}{R} = \frac{230}{460} \; \boxed{\cancel{1A}} \; = \boxed{0.5A}$

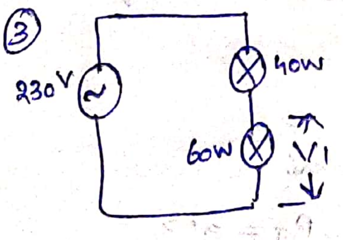
②


Sol To find V_1.

use voltage divider rule

W.K.T $R_1 = R_2 = 230$

$V_1 = \frac{230}{\cancel{460}\,2} \cdot \cancel{230} \; \boxed{= 115W}$

③


Sol To find V_1

Find R_1 & R_2

$R_1 = \frac{V^2}{P} = \frac{230^2}{60} = 881.66$

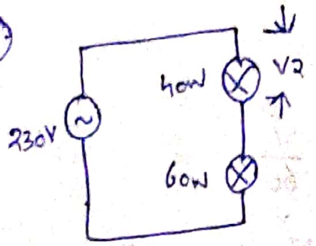
$R_2 = \frac{V^2}{P_2} = \frac{230^2}{40W} = 1322.5$

using voltage divider rule

$V_1 = \frac{881.66}{\cancel{1322.5}\;2204.16}\; 230$

$\boxed{V_1 = \cancel{158}} \; \boxed{91.99}$

(4)



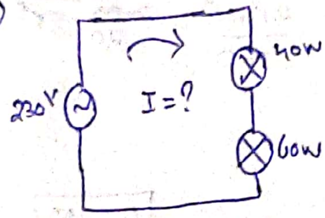
Sol To find V_2

use voltage divider rule

$$V_2 = \frac{1322.5}{2204.16} \cdot 230$$

$$\boxed{V_2 = 138}$$

(5)



Sol To find I, first find R_{Total}

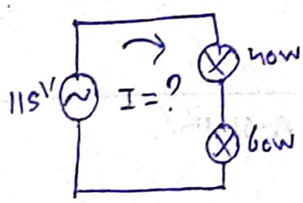
W.K.T $R_1 = 881.66$

$R_2 = 1322.5$

$R_T = 2204.16$

$$I = \frac{V}{R_T} = \frac{230}{2204.16} = \boxed{0.1A}$$

(6)

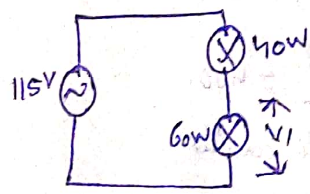


Sol To find I.

W.K.T $R_T = 2204.16$

$$I = \frac{V}{R_T} = \frac{115}{2204.16} = 0.05A$$

(7)



Sol To find V_1

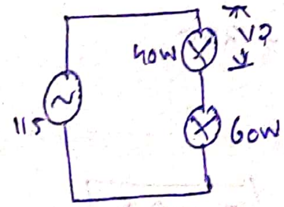
W.K.T $R_1 = 881.66$, $R_T = 2204.16$

$R_2 = 1322.5$

By using voltage divider rule

$$V_1 = \frac{881.66}{2204.16} \times 115 = \boxed{46V}$$

(8)

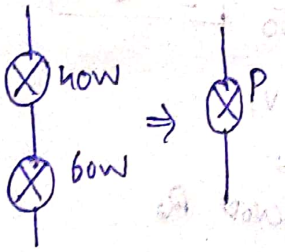


Sol By using voltage divider rule

W.K.T

$$V_2 = \frac{1322.5}{2204.16} \, 115 = \boxed{69}$$

(9)



Sol To find P

W.K.T. $R_1 = \frac{V^2}{60} = 881.66$

$R_2 = \frac{V^2}{40} = 1322.5$

$R_T = R_1 + R_2 = \frac{V^2}{60} + \frac{V^2}{40} = \frac{2V^2 + 3V^2}{120}$

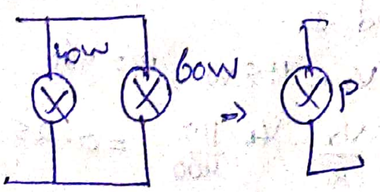
$R_T = \cancel{2204.16}$ $= \frac{5V^2}{120}$

$P = \frac{V^2}{R_T} \Rightarrow$

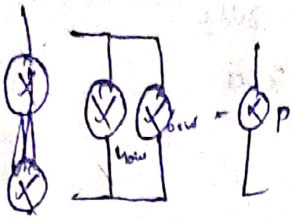
$$P = \frac{\cancel{V^2}}{5\cancel{V^2}} \cdot 120$$

$$\boxed{P = \frac{120}{5} = 24W}$$

(10)



Sol W.K.T



sol

To find P:

W.K.T

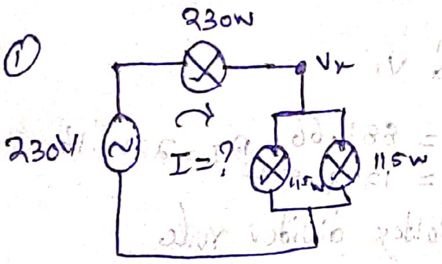
$R_1 = \frac{V^2}{40}$, $R_2 = \frac{V^2}{60W}$

$R = \frac{\frac{V^2}{40} \cdot \frac{V^2}{60}}{\frac{V^2}{40} + \frac{V^2}{60}} = \frac{\frac{V^4}{240}}{\frac{2V^2+3V^2}{120}} = \frac{V^2}{2400} \cdot \frac{120}{5V^2}$ 20

$R = \frac{V^2}{100}$

$P = \frac{V^2}{R} = \frac{V^2}{\frac{V^2}{100}} = 100$, $\boxed{P = 100}$

Series - circuit using power (Assume that)

① 

sol To find I.

To Find R_T

$R_1 = R_2 = \frac{V^2}{P} = \frac{230^2}{115} = 460.$

Due to parallel connection

R_{eq} = at Node V_x

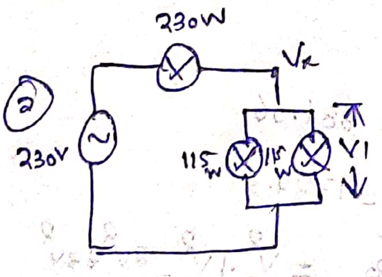
$R_{eq} = 230\,\Omega$

$R_3 = \frac{V^2}{P} = \frac{230^2}{230} = 230$

$R_T = R_3 + R_{eq}$

$= 460$

$I = \frac{V}{R} = \frac{230}{460}$ $\boxed{I = 0.5}$

② 

sol To Find V1

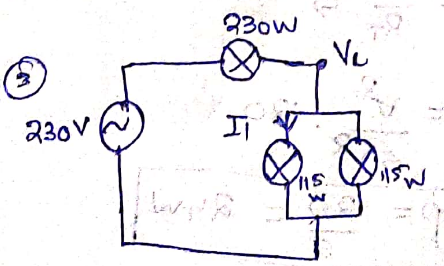
W.K.T $I = 0.5$

Voltage drop across R_3

$V_3 = I \times R$

$= 0.5 \times 230 = 115$

Due to parallel connection 115 appears both sides ($V_x = 230 - 115$)

③ 

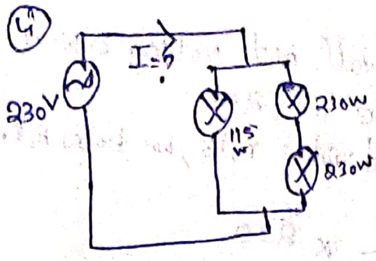
sol To Find I_1

W.K.T. $V_x = 115W$, $R_1 = 460$

$I_1 = \frac{V_x}{R_1} = \frac{V_x}{} \frac{115}{460} = 0.25$

$\boxed{I_1 = 0.25}$

(4)



sol To Find I.

Find R_T

$R_1 = 460$

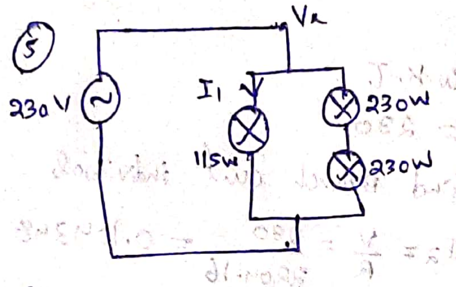
$R_2 = R_3 = 230.$

R_2 & $R_3 \rightarrow R \Rightarrow 460$

$R_T = \frac{460 \times 460}{460+460} = 230$

$I = \frac{V}{R_T} = \frac{230}{230} = \boxed{1A}$

(5)

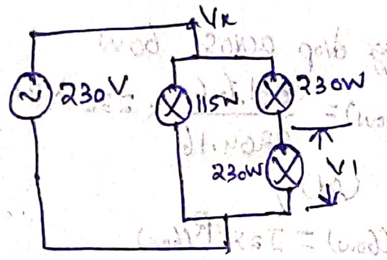


sol To find I_1

W.K.T. $R_1 = 460\Omega$, $V_x = 230V$

$I_1 = \frac{V_x}{R_1} = \frac{230}{460_2} = \boxed{0.5A}$

(6)



sol To find V_1

W.K.T. voltage divider rule &,

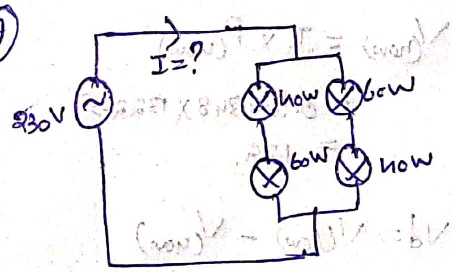
$V_x = 230V$

$R = \frac{V^2}{P} = \frac{230^2}{230} = 230$

$V_1 = \frac{230}{460_2} \times \cancel{230}$

$\boxed{V_1 = 115V}$

(7)



sol To find I

find $R_T =$

$R_1 = \frac{V^2}{60} = 881.66$

$R_2 = \frac{V^2}{40} = 1322.5$

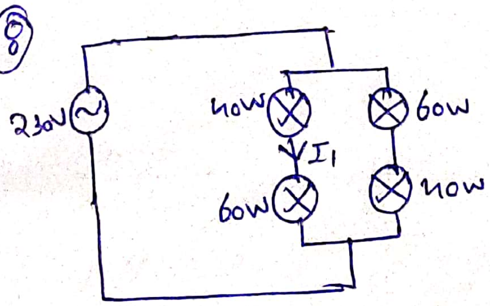
$R_1 + R_2 = 2204.16$ // in another branch

Due to parale

$R_T = 1102.08$

$I = \frac{V}{R_T} = \boxed{0.208}$

(8)



sol To find I_1

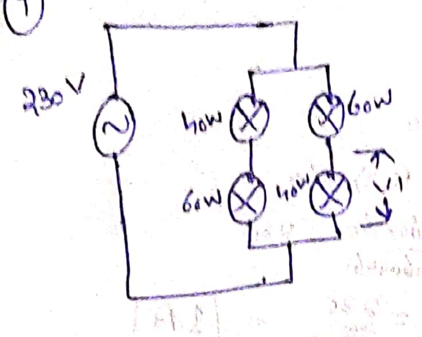
W.K.T. $V = 230V$

Resistance across Brand

$R_{eq} = 2204.16$

$I = \frac{V}{R_{eq}} = \frac{230}{2204.16} = \boxed{0.10434}$

(9)



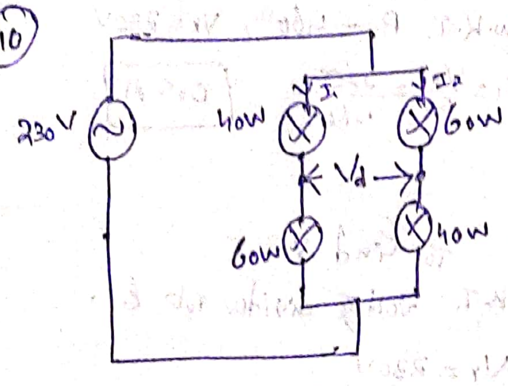
Sol To find V_1

Due to parallel ckt voltage across branch same i.e 230. Using voltage divider rule, we know R_1, R_2

$$V_1 = \frac{1322.5}{2204.16} \times 230$$

$$\boxed{V_1 = 138\,V}$$

(10)



Sol W.K.T.

$V_T = 230V$

find branch curnt individual

$$I_1 = I_2 = \frac{V}{R} = \frac{230}{2204.16} = 0.104348$$

Voltage drop across 60W

$$V_{(60W)} = \frac{881.66}{2204.16} \times 230 = 91.922$$

(or).

$$V_{(60W)} = I_2 \times R_{(60W)}$$

$$= 0.104 \times 881.66 = 91.999$$

$$\boxed{\approx 92}$$

$$V_{(40W)} = I_1 \times R_{(40W)}$$

$$= 0.104348 \times 1322.5$$

$$= 138.$$

$$V_d = V_{(60W)} - V_{(40W)}$$

$$= 138 - 92$$

$$\boxed{V_d = 46V}$$