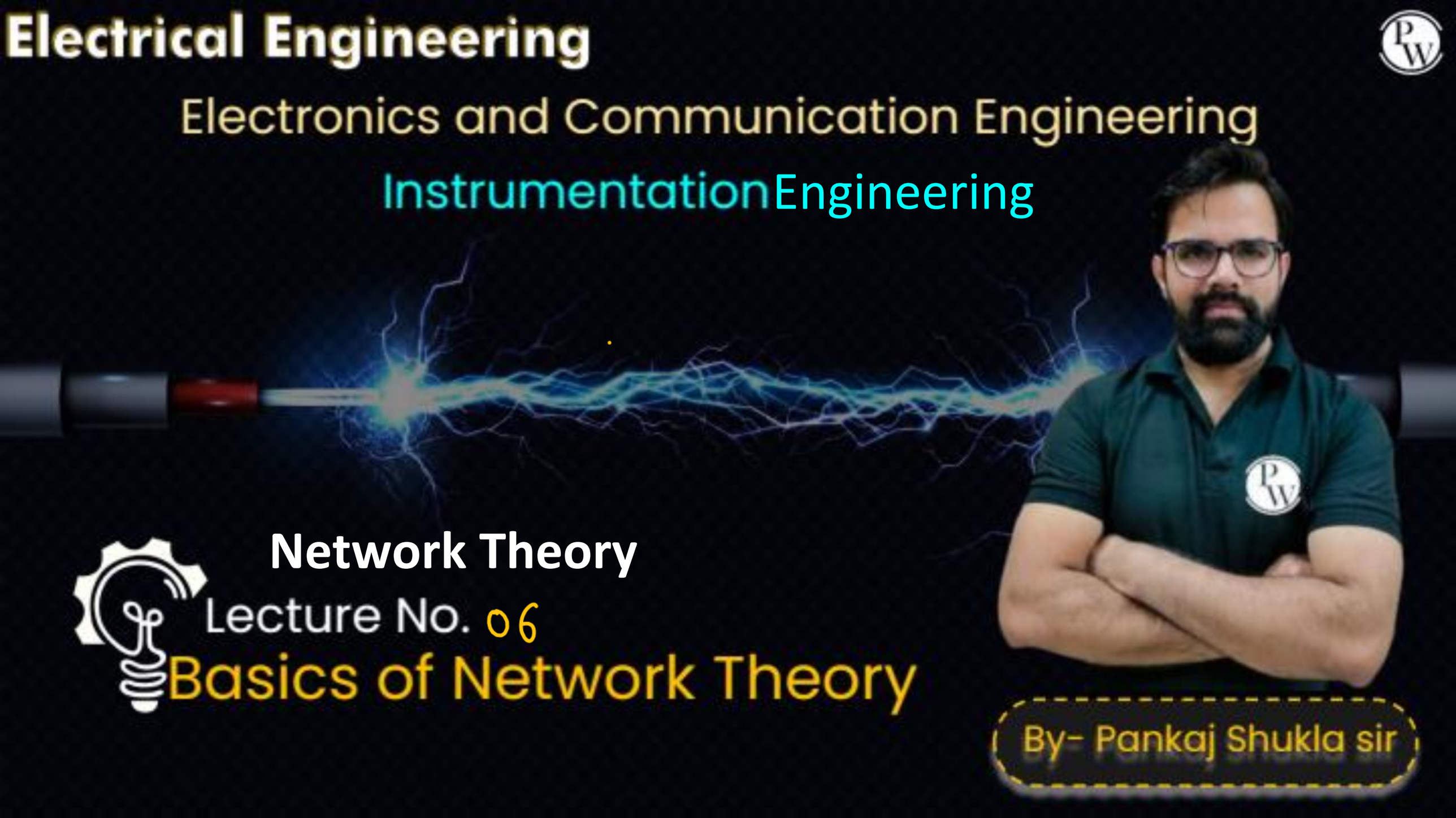
Electrical Engineering

Electronics and Communication Engineering

Instrumentation Engineering



Network Theory

Lecture No. 06

Basics of Network Theory

By- Pankaj Shukla sir

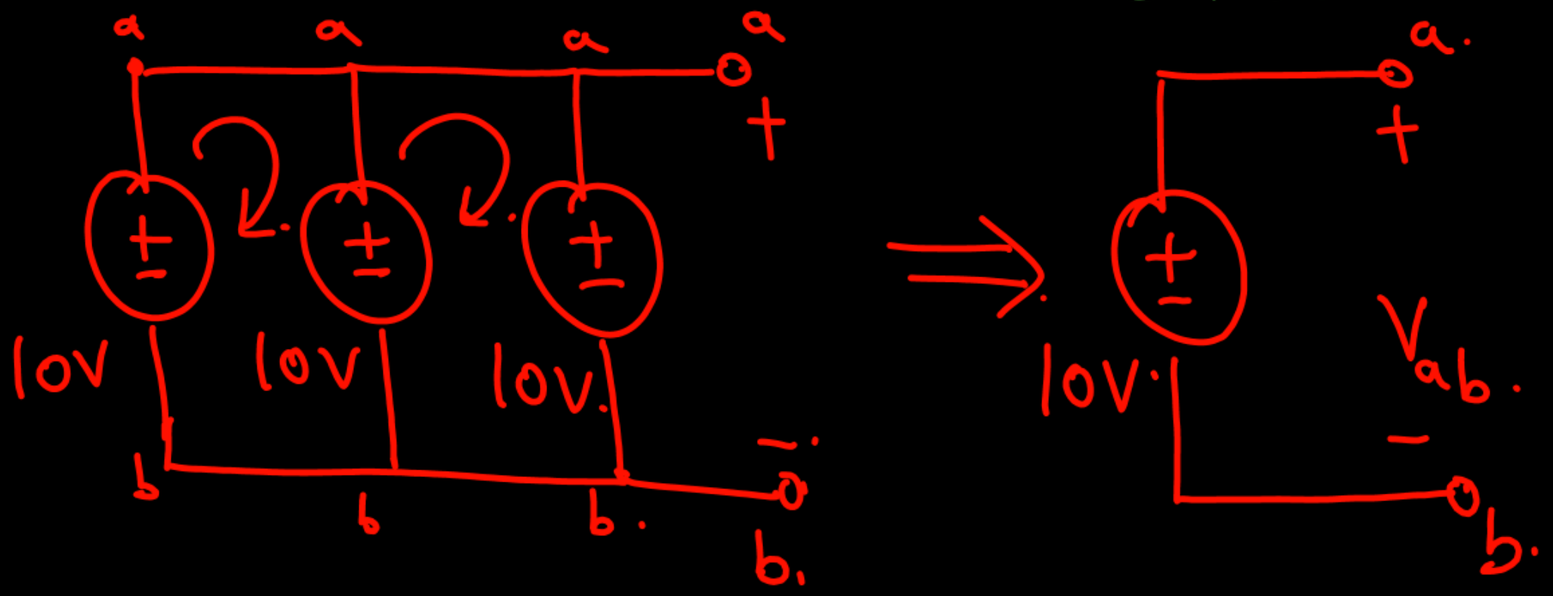
1. Series & Parallel operation :
2.
3.
4.
5.
6.

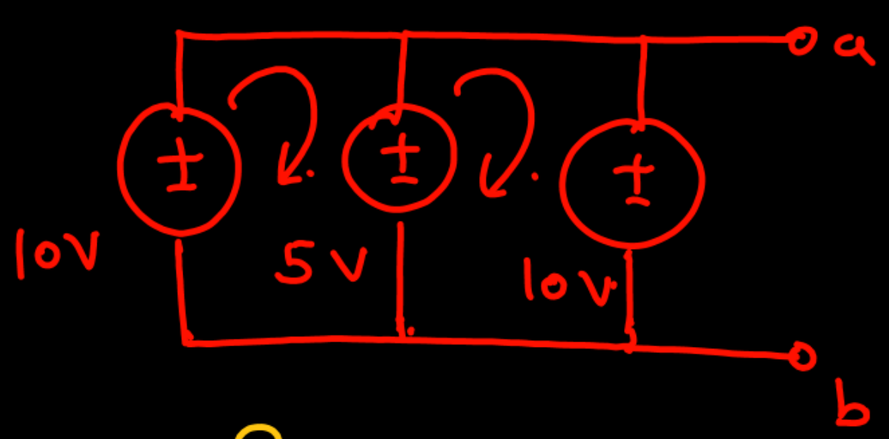
1. Previous continue.
2. Question Discussion.
3.
4.
5.
6.

(2) Parallel operation of Voltage Sources:

(a) Ideal Sources:

Here the ideal voltage sources having same magnitude & same polarity can only be parallely operated. if it is not satisfying i.e means KVL is failed. Hence cut will become invalid.

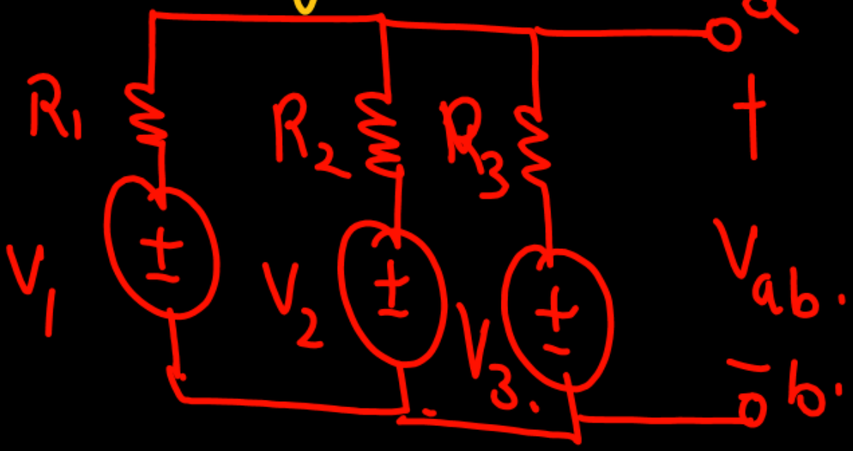




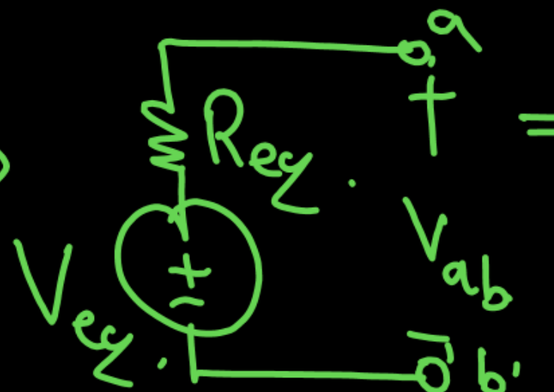
$\Rightarrow$ KVL failed $\rightarrow$ (Invalid circuit)

(b) Practical Voltage Sources:

- Here there is no such condition as we have discussed in case of parallel operation of Ideal voltage sources: Here here there is no constraints.



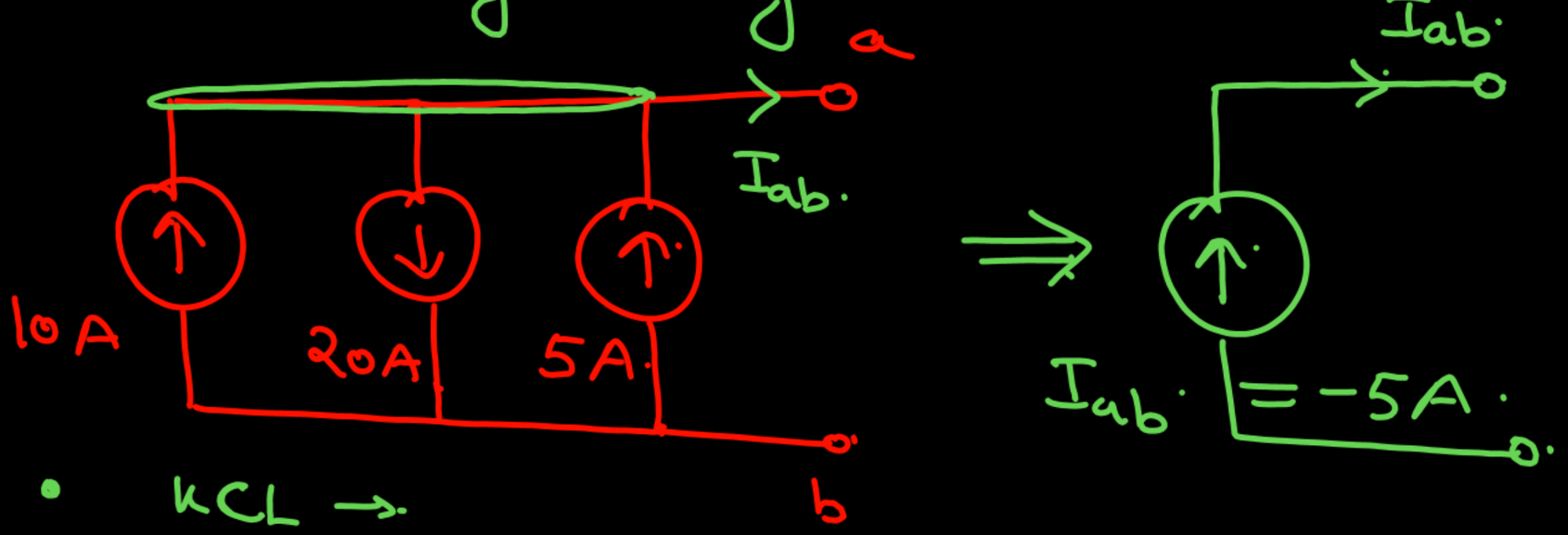
$\Rightarrow$



$\Rightarrow$ This model is given by (Milliman's theorem)

③ Parallel operation of current Sources:

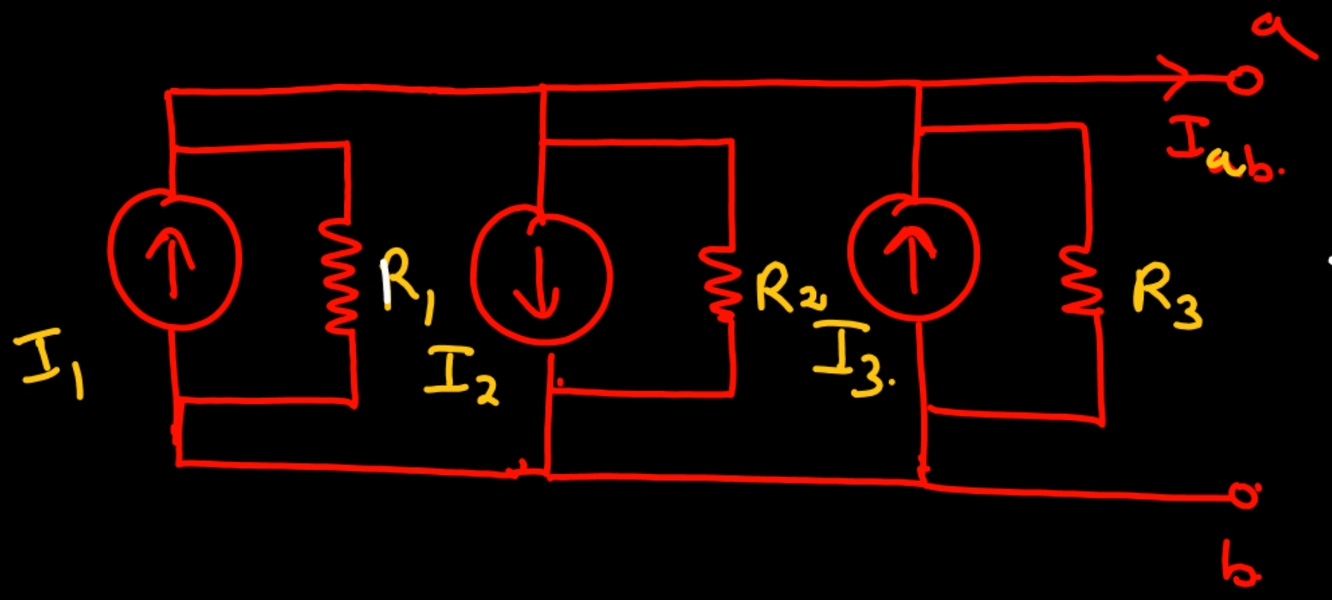
- Simply apply KCL thats it.



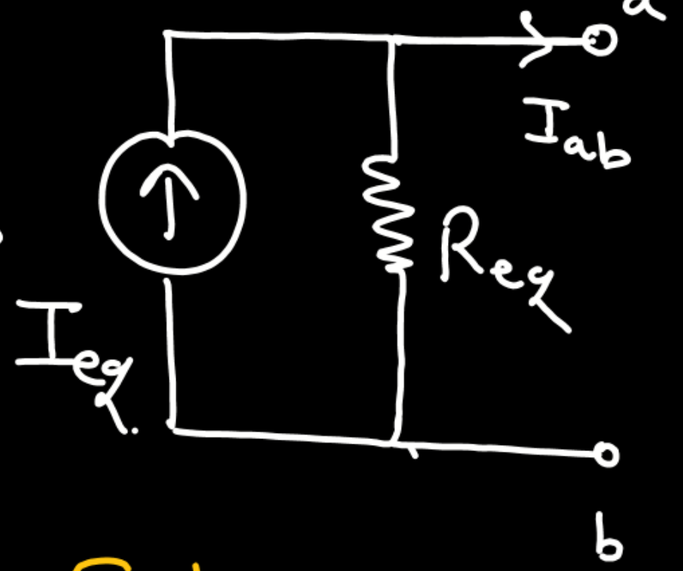
- KCL →

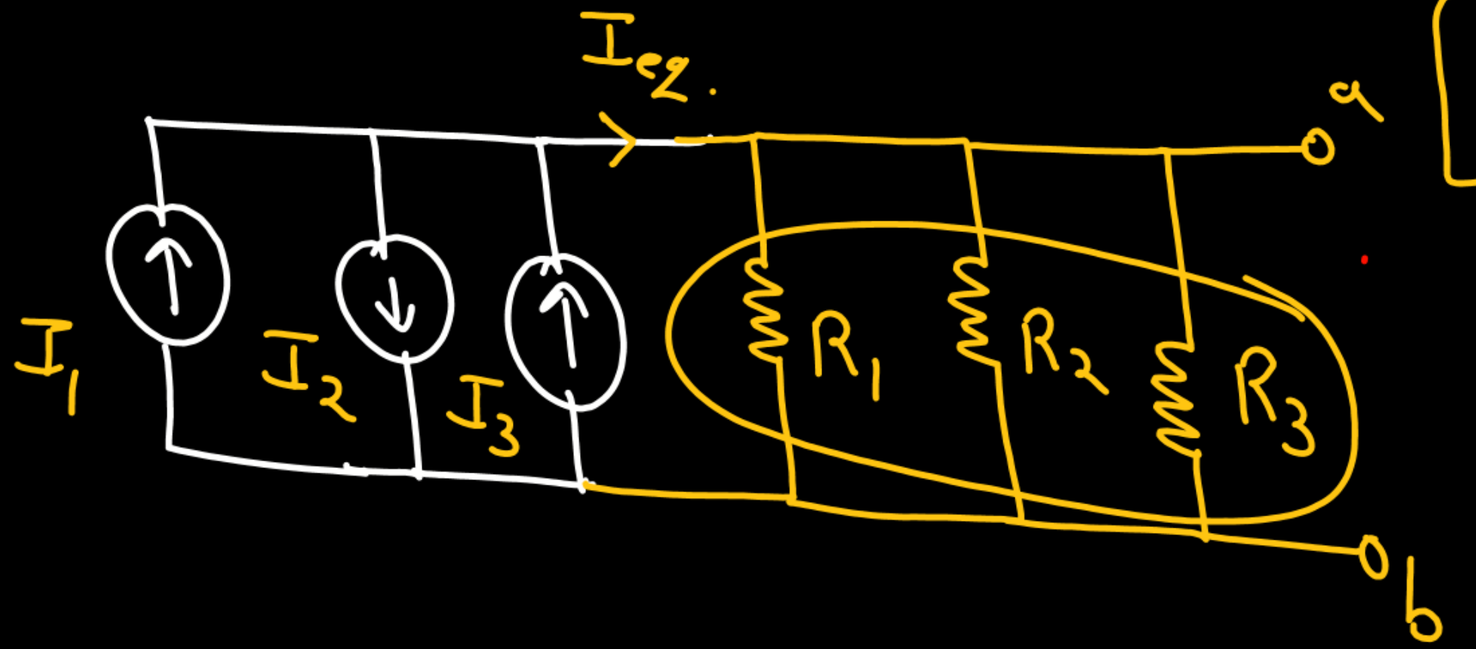
$$10 + 5 = 20 + I_{ab}$$

$$[I_{ab} = 15 - 20 = -5A]$$



$\Rightarrow$





$$\left[\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right]$$

$$I_{eq} + I_2 = I_1 + I_3.$$

$$\left[I_{eq} = I_1 + I_3 - I_2\right]$$

Note: Inspection Method → 02.

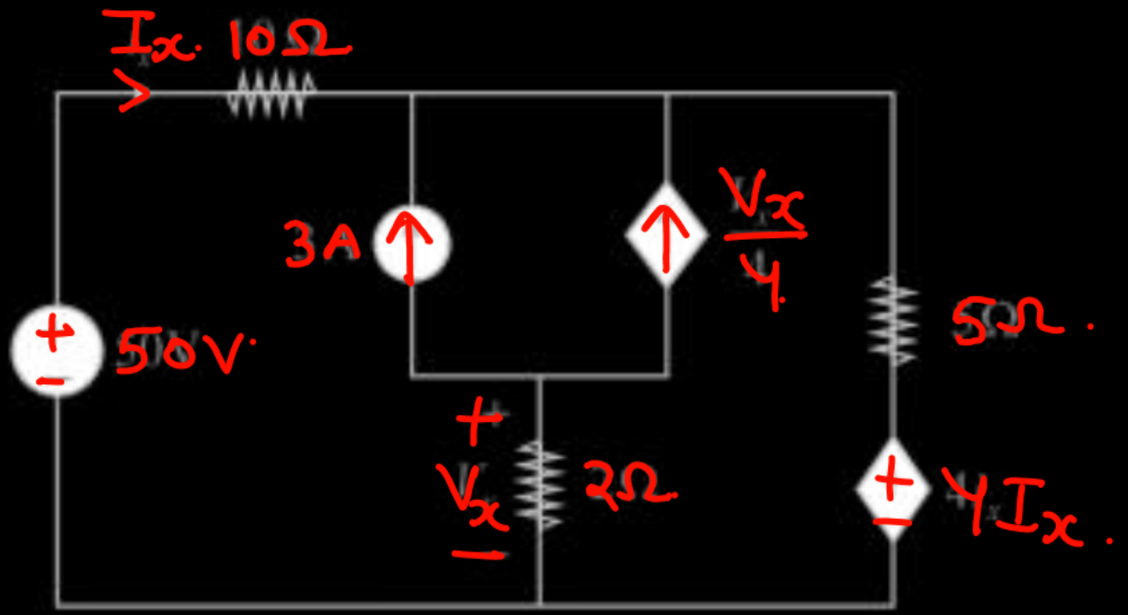
Here Now,

Inspection method - 02 = (I.M - 01) + Series + Parallel operation

Question

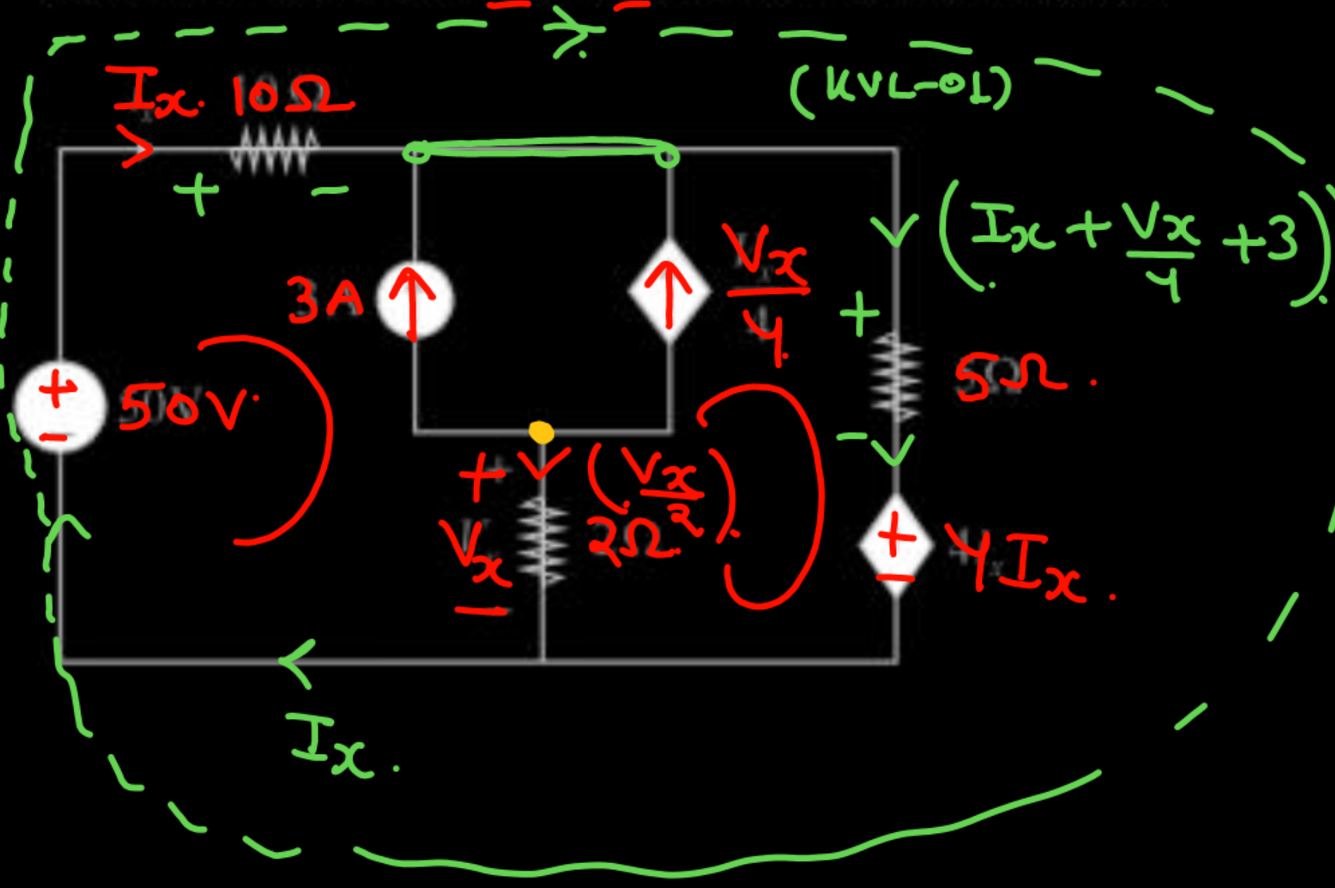
Find the value of Vx & Ix in the Below circuit.

(Inspection Method)



Question

Find the value of Vx & Ix in the Below circuit.



(Inspection Method)

- KVL-ol.

$$10I_x + 5\times\left(I_x+\frac{V_x}{4}+3\right)+4I_x = 50$$

$$19I_x + \frac{5}{4}V_x = 35$$

$$[19\times4I_x + 5V_x = 140] \quad \text{—①}$$

- $$3+\frac{V_x}{4}+\frac{V_x}{2}=0$$

$$V_x\left(\frac{1}{4}+\frac{1}{2}\right)=-3.$$

$$V_x\left(\frac{1+2}{4}\right)=3.$$

$$V_x=-\frac{12}{3}.$$

$$(V_x=-4\ \text{Volt})$$

From eqⁿ (1)

$$19 \times 4 I_x + 5 \times (-4) = 140$$

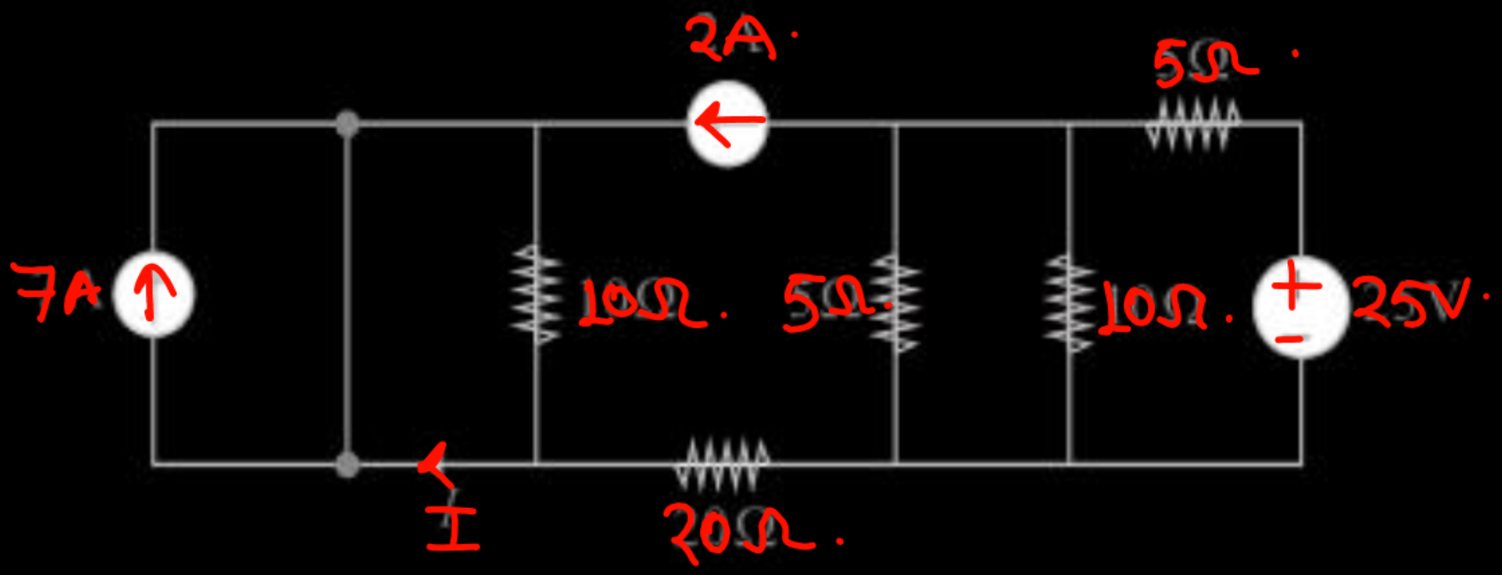
$$19 \times 4 I_x = 140 + 20 = 160.$$

$$\left[I_x = \frac{160}{19 \times 4} = 2.1052\ A \right]$$

Question

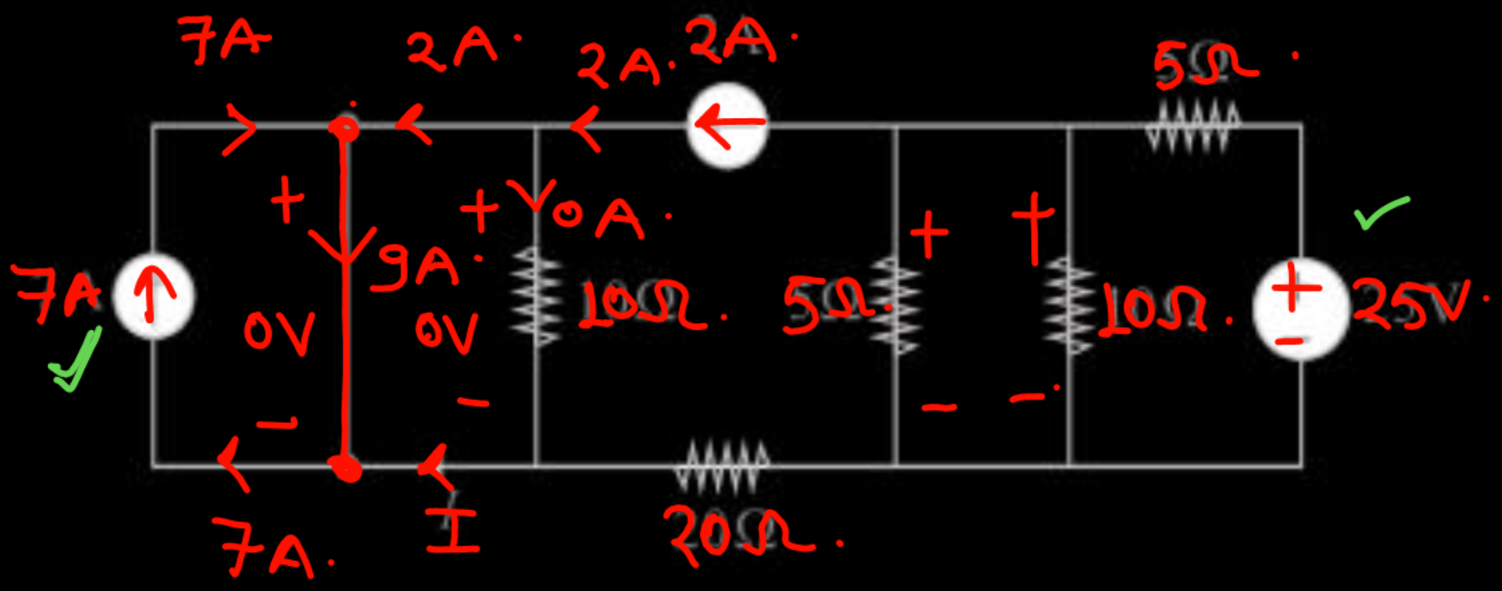
Find the current "I" & Power Delivered by 2 A current source.

{Inspection Method}



Question

Find the current "I" & Power Delivered by 2 A current source.

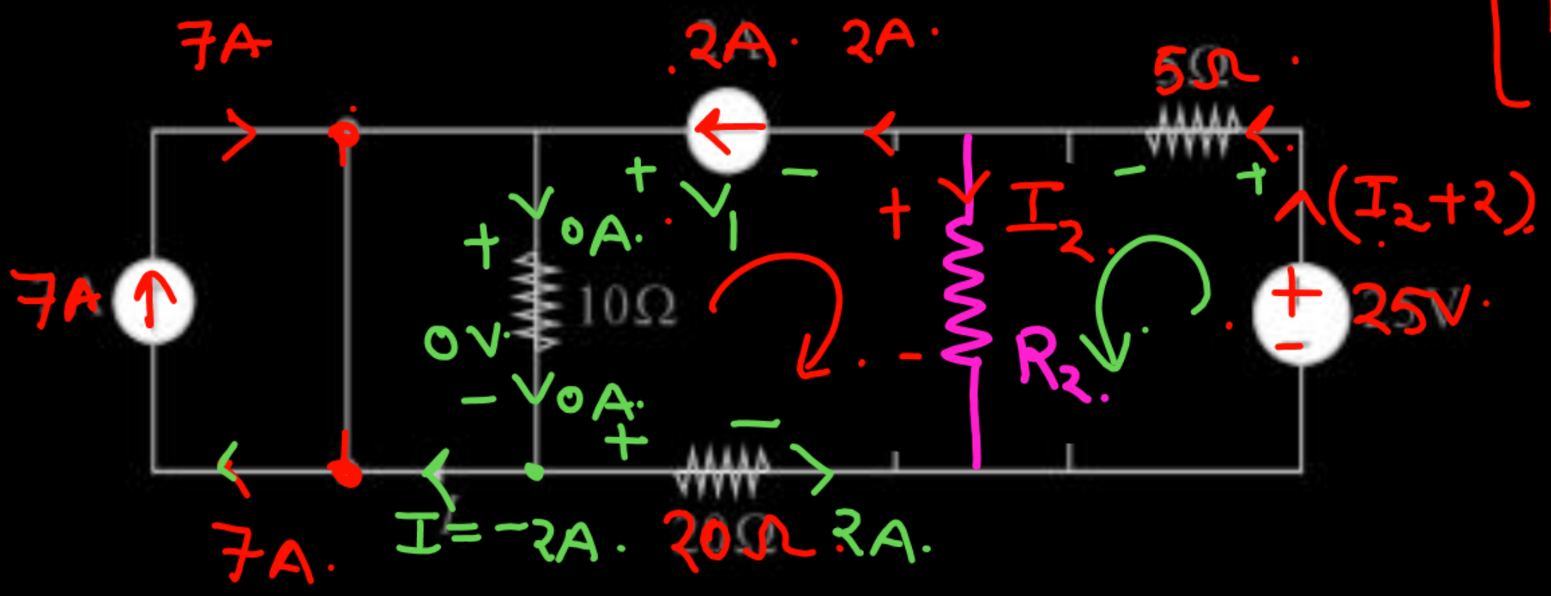


$$I + g = 7$$

$$[I = 7 - g = -2A].$$

Question

Find the current "I" & Power Delivered by 2 A current source.



$$\left[R_2 = \frac{10 \times 5}{15} = \frac{10}{3}\,\Omega\right]$$

$$20 \times 2 = V_1 + I_2 \times \frac{10}{3}$$

$$\left[3V_1 + 10I_2 = 20 \times 2 \times 3\right] \rightarrow (1)$$

- $5 \times (I_2 + 2) + \frac{10}{3} \times I_2 = 25$

$$I_2\left(5 + \frac{10}{3}\right) = 25 - 10$$

$$I_2 \times \left(\frac{25}{3}\right) = 15$$

$$\left[I_2 = \frac{15 \times 3}{25} = 1.8\,A\right]$$

From eqn (1).

$$\left[V_1 = \frac{40 \times 3 - 10 \times 1.8}{3} = 34 \text{ Volt}\right]$$

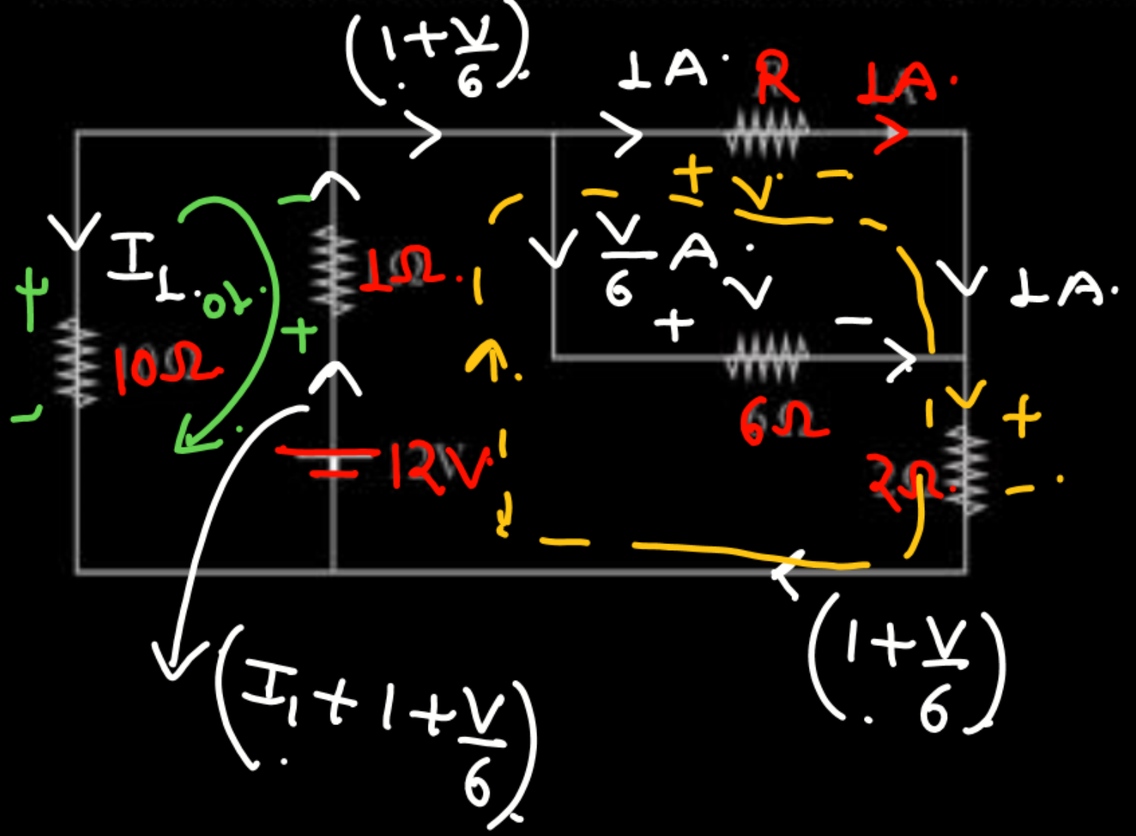
- $P_{2A} = V_1 \times 2 = 34 \times 2 = 68$ watt (D).

or.

-68 Watt (A).

Question

Find the value of R so that 1A current would flow in it, for the network shown.



"Inspection Method".

$$\left[R = \frac{V}{I} = \frac{V}{1}\right]$$

$$\text{(KVL-01)}$$

$$10I_1 + 1\times\left(I_1 + 1 + \frac{V}{6}\right) = 12$$

$$11I_1 + \frac{V}{6} = 11$$

$$[66I_1 + V = 66] \quad -(1)$$

- KVL–02.

$$12 = 2\times\left(I_1+1+\frac{V}{6}\right)+V+2\times\left(1+\frac{V}{6}\right)$$

$$I_1+V\left(\frac{1}{6}+1+\frac{2}{6}\right) = 12-3 = 9$$

$$\left[6I_1+9V = 6\times9\right] \text{——} (2)$$

$$\left[R = \frac{V}{I} = 5.3877\ \Omega\right]$$

- $66I_1+V = 66$

$11\times\left[6I_1+9V = 6\times9\right]$

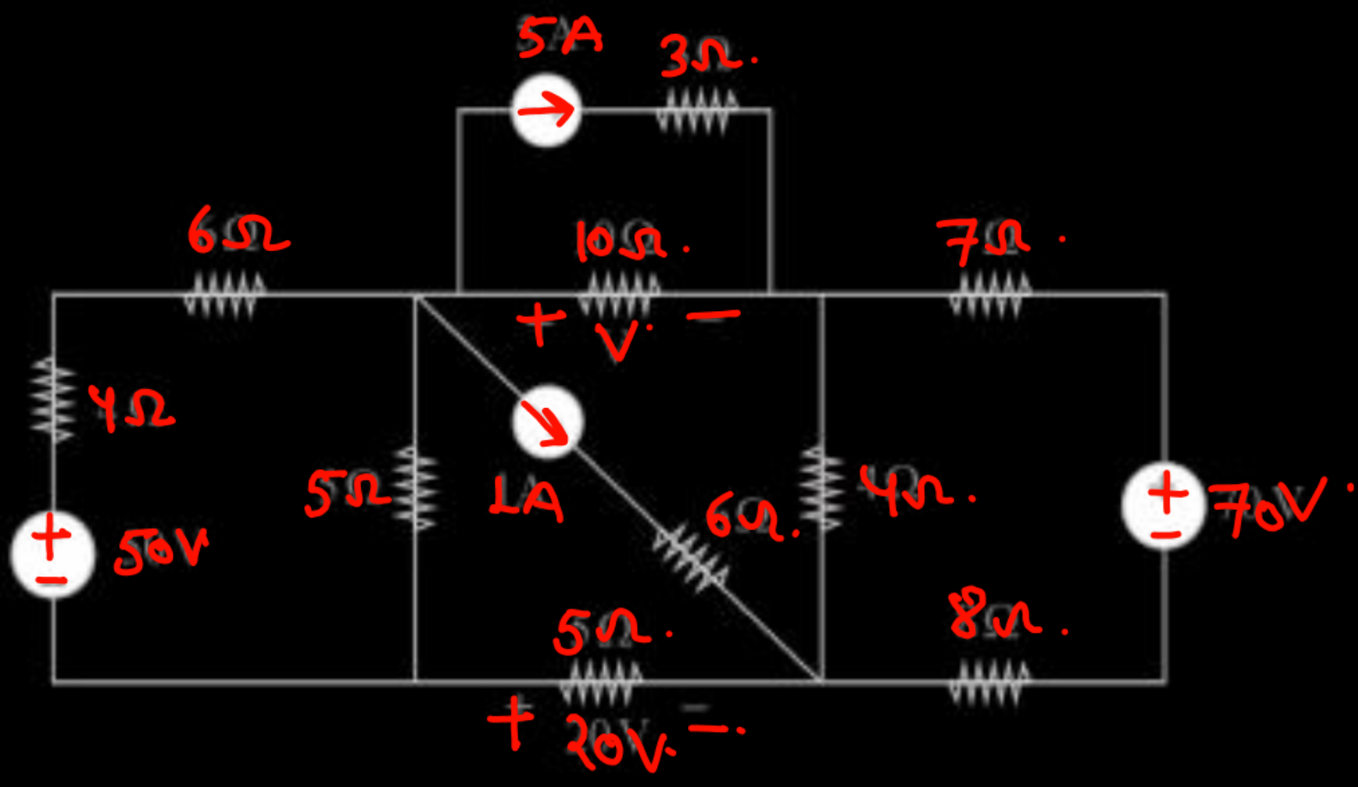
$$V\left(1-11\times9\right) = 66-6\times9\times11$$

$$\left[V = -\frac{528}{-98} = 5.3877\ \text{volt}\right]$$

Question

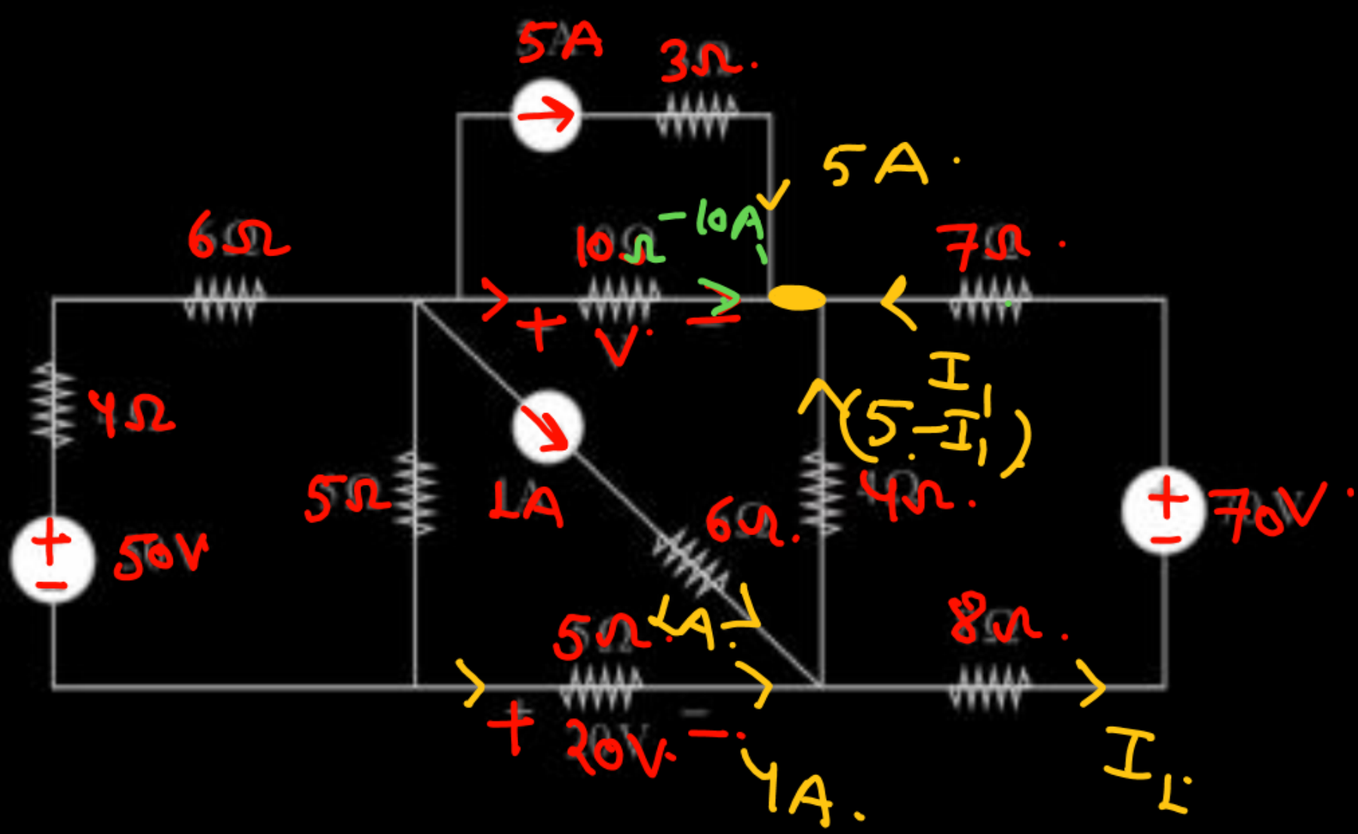
In the given circuit, the value of V in volt is_____.

• (Inspection Method).



Question

In the given circuit, the value of V in volt is_____.



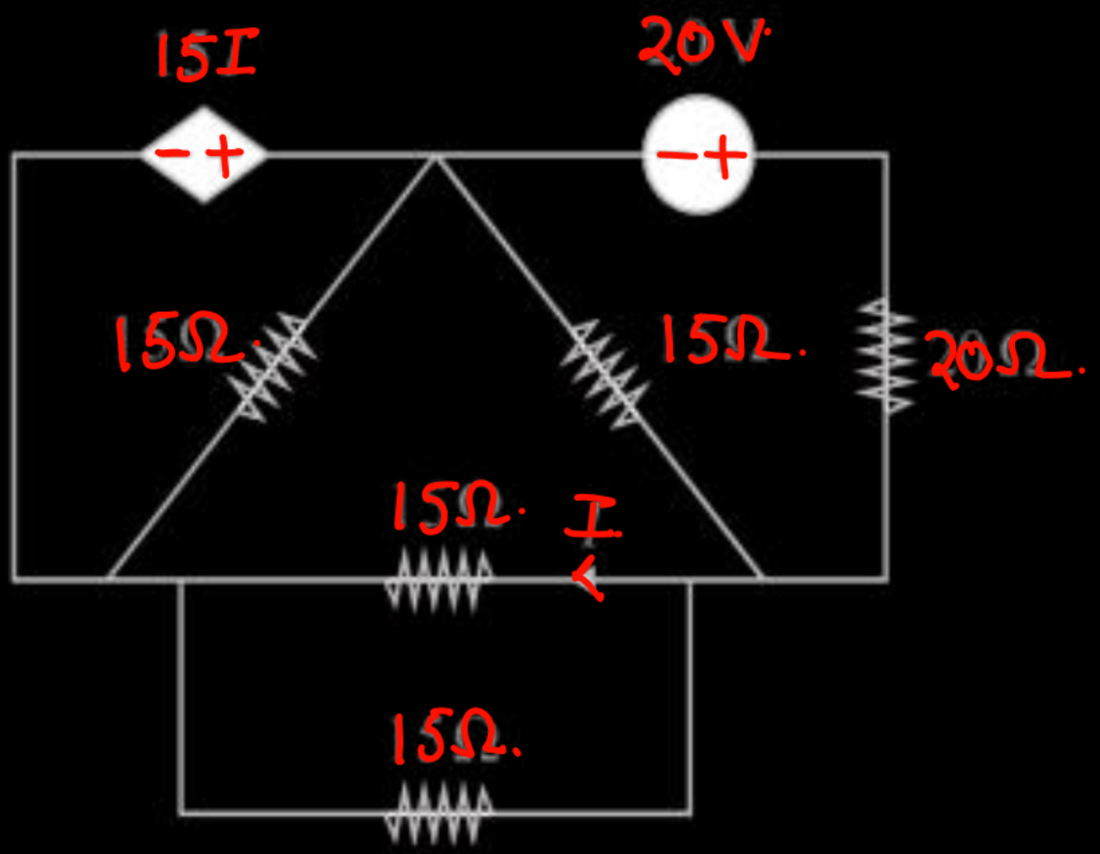
• (Inspection method).

$$V = 10 \times (-10) = -100V$$

Question

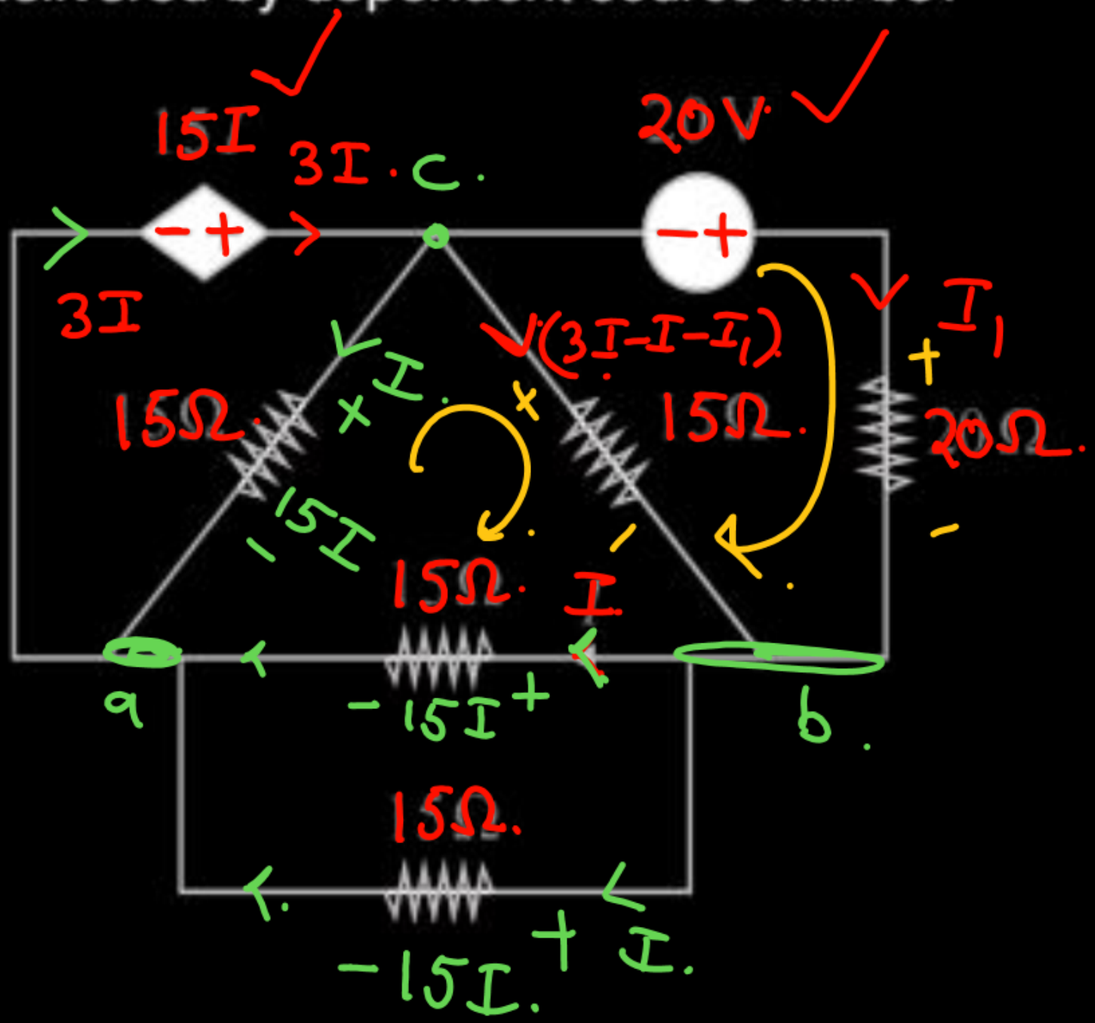
In the given circuit, the value of current flowing in 15 ohm & the power delivered by dependent source will be?

(Inspection method)



Question

In the given circuit, the value of current flowing in 15 ohm & the power delivered by dependent source will be?



- $15I = 15I + 15 \times (3I - I - I_1)$

$15 \times (2I - I_1) = 0$

$[2I - I_1 = 0]$ —— (1)

- $20I_1 + 15 \times (2I - I_1) = 20$ —— (2)

From eqn (1) & (2)

$20I_1 + 0 = 20$

$[I_1 = 1A]$

$2I - I_1 = 0$

$(I = 0.5A)$

- $P_{15I} = (15 \times I) \times (3I)$.

$= 15 \times 0.5 \times 3 \times 0.5 = 11.25$ watt (D).

on.

-11.25 watt (A).

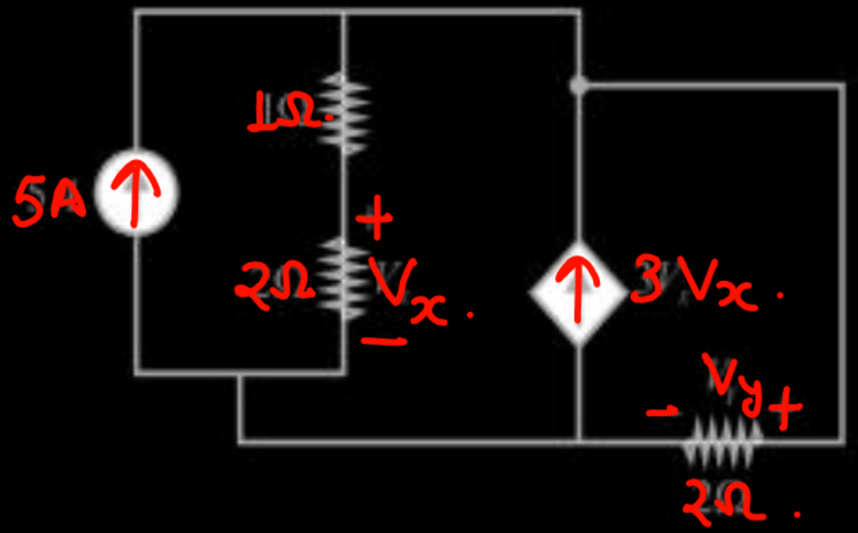
Question

H.W. Telegram

The voltage Vy across the resistance is

(a) -2V (b) -4.28V

(c) -8.21V (d) -10V



pankajshuklasirPW

↓

Telegram Id :

Thank you

GW

Soldiers !