NORTH SOUTH UNIVERSITY
DEPARTMENT OF ELECTRICAL &
COMPUTER ENGINEERING

Assignment-2

Spring 2022

EEE141: Electrical Circuits I
Section: 08

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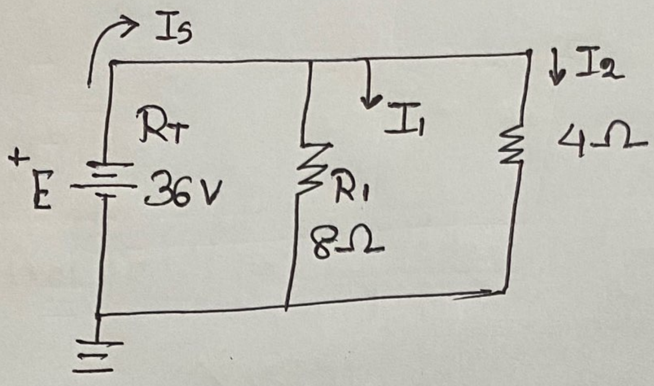
Section 6.3

16. Here,



(a) From Circuit,

$$R_T = R_1 \parallel R_2$$
$$= 8\Omega \parallel 24\Omega$$
$$= \frac{8\Omega \times 24\Omega}{8\Omega + 24\Omega}$$
$$= 6\Omega$$

(b) Here, the voltage source and the resistance are in parallel,

Therefore, $V_{R1} = 36\,V$

$V_{R2} = 36\,V$

(c) From circuit,

$$I_S = \frac{E}{R_T} = \frac{36V}{6\Omega} = 6A$$

∴ the source current is $I_S = 6A$

The current through the first branch,

$$I_{R_1} = \frac{V_{R_1}}{R_1}$$

$$= \frac{36V}{8\Omega} = 4.5A$$

The current through the second branch

$$I_{R_2} = \frac{V_{R_2}}{R_2} = \frac{36^2}{24\Omega} = 1.5A$$

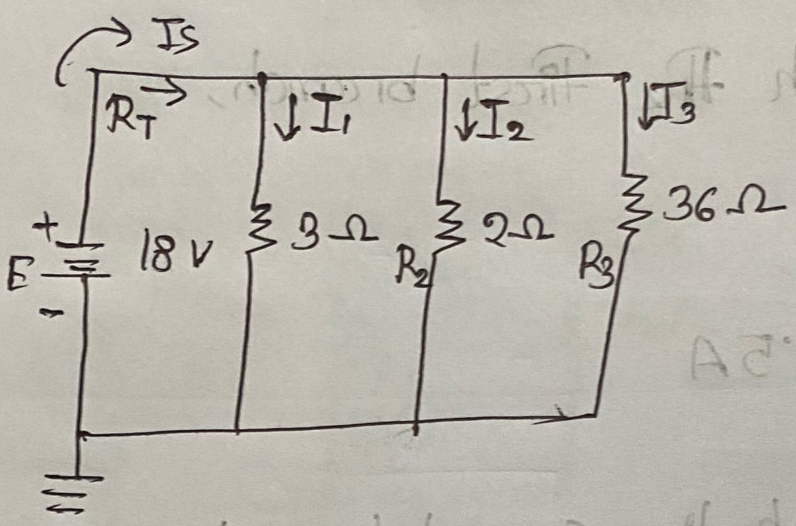
(d) By applying kirchoff's current law,

$$I_S = I_{R_1} + I_{R_2}$$

$$\Rightarrow 6A = 4.5A + 1.5A$$

$$\Rightarrow 6A = 6A \text{ (Checks)}$$

11. Here,



(a) From circuit,

$$R_T = \frac{1}{\frac{1}{3\Omega} + \frac{1}{9\Omega} + \frac{1}{36\Omega}}$$

$$= \frac{1}{0.3335 + 0.1115 + 0.0285}$$

$$= \frac{1}{472 \times 10^{-3}}$$

$$= 2.12\,\Omega$$

(b) Here,

Here, the voltage source the resistance to parallel.

Therefore,

$$V_{R_1} = V_{R_2} = V_{R_3} = 18V$$

(c) $$I_S = \frac{E}{R_T}$$

$$= \frac{18V}{2.12\Omega}$$

$$= 8.5A$$

Current through first branch,

$$\therefore I_1 = \frac{V_{R_1}}{R_1} = \frac{18V}{3\Omega} = 6A$$

Current through second branch

$$I_2 = \frac{V_{R_2}}{R_2} = \frac{18V}{9\Omega} = 2A$$

Current through third branch

$$\therefore I_3 = \frac{V_{R_3}}{R_3} = \frac{18V}{36\Omega} = 0.5A$$

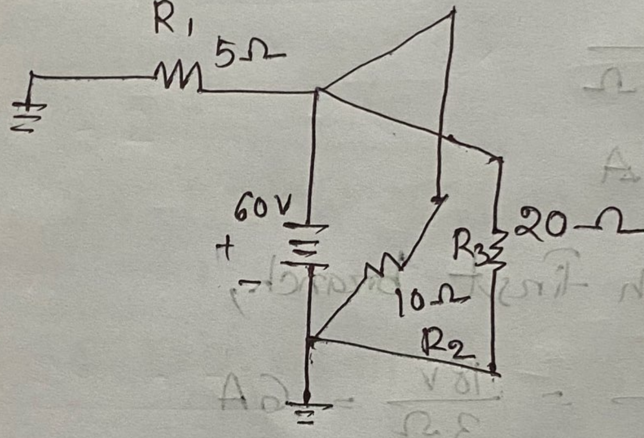
(d) $I_S = I_1 + I_2 + I_3$

$\Rightarrow 8.5\,A = (6A + 2A + 0.5A)$

$\Rightarrow 8.5\,A = 8.5A$ (checks)

6.4

21.



Total resistance, $R_T = \dfrac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$

$= \dfrac{1}{\frac{1}{5\Omega} + \frac{1}{10\Omega} + \frac{1}{20\Omega}}$

$= \dfrac{1}{0.25 + 0.15 + 0.055}$

$= 2.86\,\Omega$

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∴ The power delivered by the source $P = E \cdot I_S$

$$= E \cdot \frac{E}{R_T}$$

$$= \frac{E^2}{R_T}$$

$$= \frac{(60V)\times(60V)}{2.86\,\Omega}$$

$$= 1.26\,kW$$ Ans

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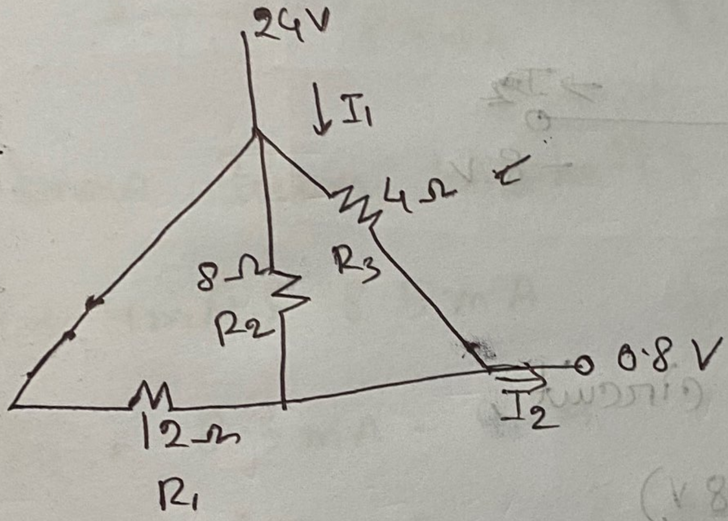


(a) From circuit,

$R_1 \parallel R_2$

Considering $R_1 = 12\,\Omega$

$R_2 = 8\,\Omega$

$R_3 = 4\,\Omega$

$$R_T = \frac{R_{T_1} R_3}{R_{T_1} + R_S} \quad \text{Here } R_T \parallel R_3$$

$$= \frac{(4.8\,\Omega)(4\,\Omega)}{4.8\,\Omega + 4\,\Omega}$$

$$= 2.182\,\Omega$$

Again,

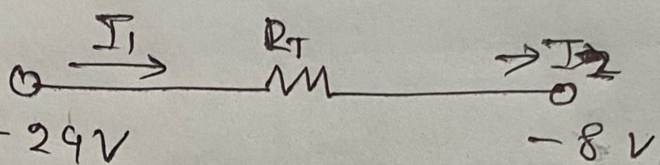


Fig - 2

Applying KVl the circuit,

$$I_1 = \frac{24V - (-8V)}{2.182\,\Omega}$$

$$= 14.67 A$$

(b) Here, $P_4 = \frac{V^2}{R} = \frac{(24V - (-8V))^2}{4\,\Omega}$

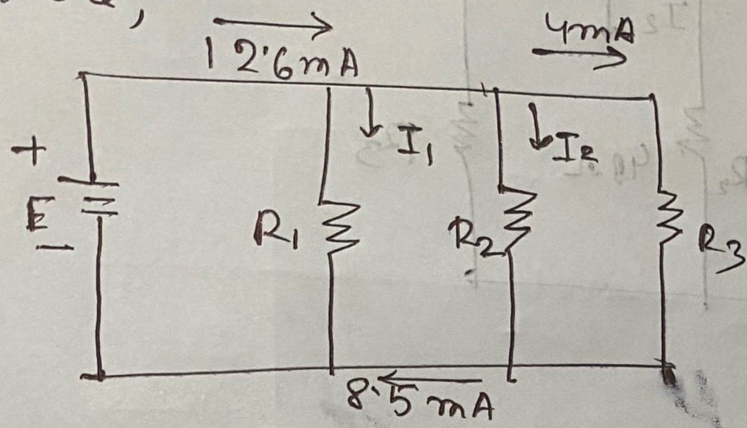
$$= 256 \,\mathrm{V\Omega}$$

(c) From Fig - 2, $I_2 = I_1$

$I_2 = 14.67A$ Ans

6'5

24 Here,



We know from kirchoff's current Law,

$$I_2 + 4mA = 8.5mA$$

$$\Rightarrow I_2 = 8.5mA - 4mA$$

$$= 4.5 mA$$

Again, $12.6 mA = I_1 + I_2 + 4mA$

$$\Rightarrow 12.6 mA = I_1 + 4.5 mA + 4mA$$

$$\Rightarrow I_1 = 12.6mA - 8.5mA$$

$$= 4.1 mA \text{ (Ans)}$$

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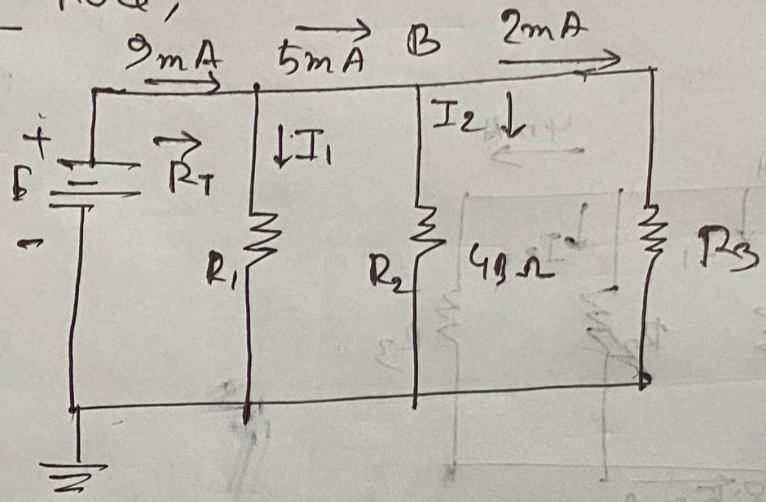
27 Here,



Applying kirchoff's law,

$5mA = 2mA + I_2$

$\Rightarrow I_2 = 3mA$

So, $E = I_2 R_2$

$= (3mA)(4k\Omega)$

$= 12V$

Applying Kirchoff current law at node A,

$9mA = 5mA + I_1$

$I_1 = 9mA - 5mA$

$= 4mA$

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So apply ohm's law,

$$E = I_1 R_1$$

$$R_1 = \cancel{I} \frac{E}{I_1}$$

$$\therefore R_1 = \frac{12V}{4mA} = 3k\Omega$$

Apply ohm's Law,

$$E = I_3 R_3$$

$$= \frac{E}{I_3}$$

$$= \frac{12V}{2mA} = 6k\Omega$$

Again, $E = I_T R_T$

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

$$= \frac{12V}{9mA}$$

$$= 1.33 k\Omega \quad \text{Ans}$$

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6.6

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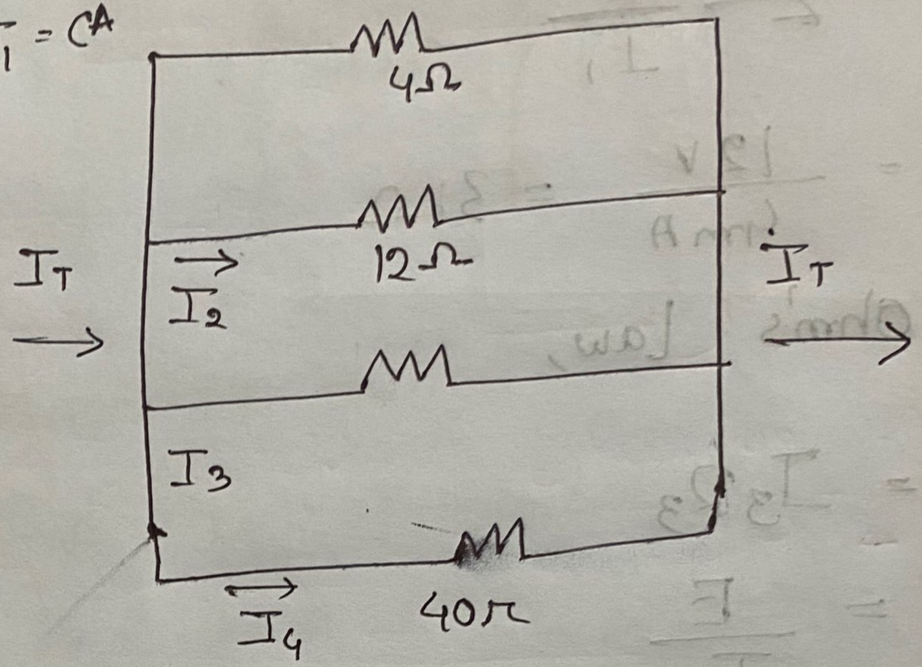
Here, $I_1 = 6A$



Since,

$$I_2 = \frac{4\Omega}{12\Omega} I_1$$

$$= \frac{1}{3} I_1$$

$$= \frac{1}{3}(6A)$$

$$= 2A$$

Here, $I_1 = 6A$

Again, $I_2 = \frac{4\Omega}{2\Omega} I_1$

$$= 2I_1$$

$$= 2 \times 6A = 12A$$

Again, $I_4 = \frac{4\Omega}{40\Omega} I_1$

$= \frac{1}{10} I_1$

$= \frac{1}{10} \times 6A$

$= 0.6A$

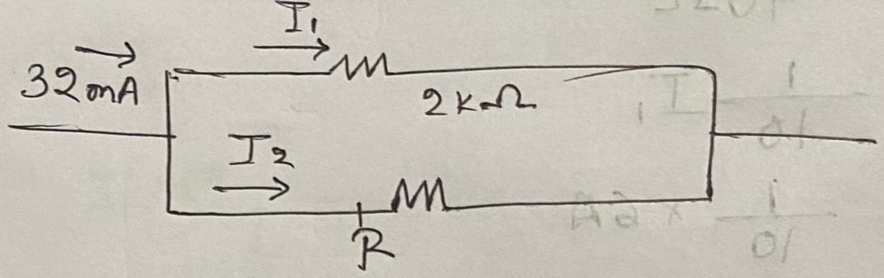
$I_T = I_1 + I_2 + I_3 + I_4$

$= (6A + 2A + 12A + 0.6A)$

$= 20.6\ A$

Ans

33 Here,



(a) Apply Kirchoff's current,

$$I_1 + I_2 = 32\,mA \quad \text{--- (1)}$$

$$\Rightarrow 3I_2 + I_2 = 32\,mA$$ [Relation in two branc $I_1 = 3I_2$

$$\Rightarrow 4I_2 = 32\,mA$$

$$I_2 = 8\,mA$$

Using current divider rule,

$$I_2 = \left(\frac{2k\Omega}{R + 2k\Omega}\right)(32\,mA)$$

$$\Rightarrow 8\,mA = \left(\frac{2k\Omega}{R + 2k\Omega}\right)(32\,mA)$$

$$\Rightarrow R + 2k\Omega = \left(\frac{32\,mA}{8\,mA}\right)(2k\Omega)$$

$$\therefore R = (4)(2k\Omega) - 2k\Omega$$

$$= 6k\Omega$$

$\therefore$ Unknown Resistance R is $6k\Omega$

(b) $I_1 + I_2 = 32mA$ ~~Now~~, Here, $I_1 = 3I_2$

$\Rightarrow 3I_2 + I_2 = 32mA$

$\Rightarrow 4I_2 = 32mA$

$\therefore I_2 = 8mA$

So, $I_1 = 3I_2$

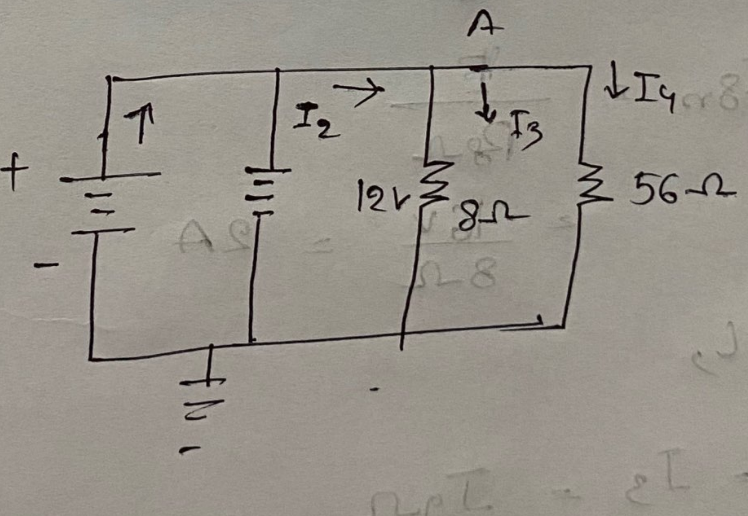
$= 3(8mA)$

$= 24mA$

$\therefore I_1 = 24mA$ Ans

6·7

36 Here,



(a) Here

$R_T = 8\Omega \parallel 56\Omega = 7\Omega$

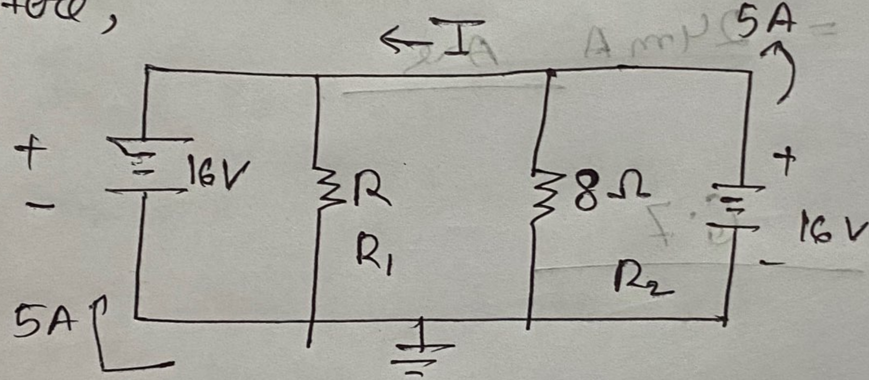
In parallel voltage circuit, the currents from the source are same so,

$$I_2 = I_3 = \frac{E}{R_T}$$

$$= \frac{12V}{7\Omega} = 1.71A$$

Again, $I_1 = \frac{1}{2} I_2 = \frac{1}{2}(1.71A) = 0.86A$ Ans

37 Here,



Here, $I_{8\Omega} = \frac{E}{R_{8\Omega}}$

$$= \frac{16V}{8\Omega} = 2A$$

Using KCL,

$$I = I_3 - I_{8\Omega}$$

$$= 5A - 2A$$

$$= 3A$$

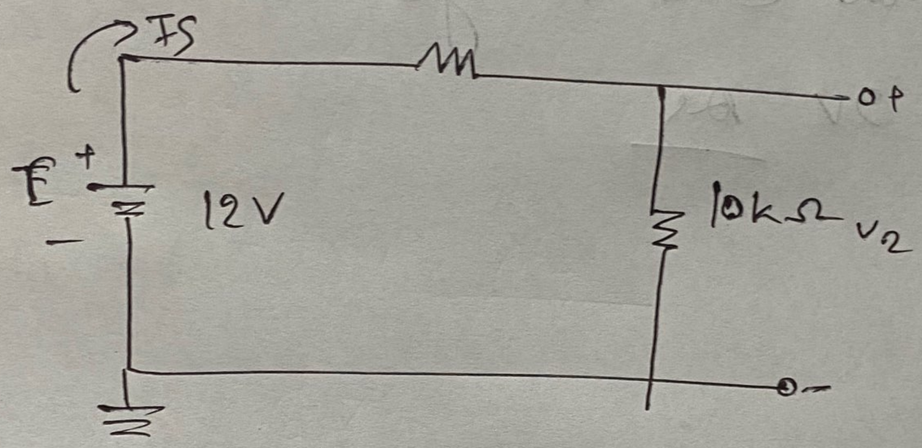
$\therefore I_R = I + I_S$

$= 3A + 5A$

$= 8A$

$\therefore R = \dfrac{E}{I_R} = \dfrac{16V}{8A} = 2\Omega$ Ans.

6.8



(a) $I_S = \dfrac{E}{R_T} = \dfrac{E}{R_1 + R_2} =$

$I_S = \dfrac{12V}{100\Omega + 10000\Omega} = 1.188mA$

$\therefore V_L = (1.188mA)(10k\Omega)$

$= 11.92$

(b) $I_S = \dfrac{E}{R_1} = \dfrac{12V}{100\Omega} = 0.12A$

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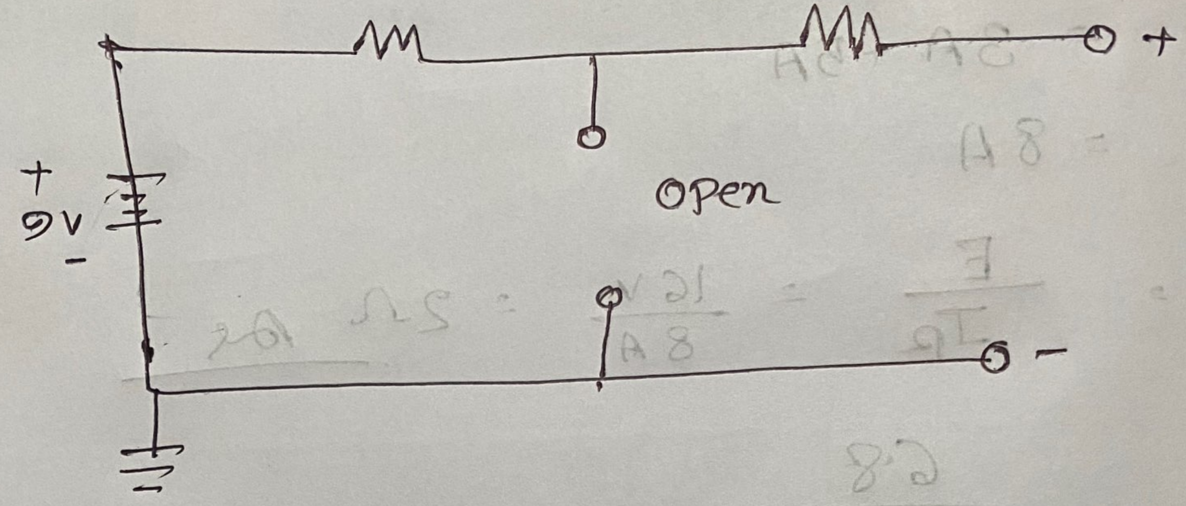
(c)



∴ In parallel case voltage are same

$V_L = 9V$ Ans