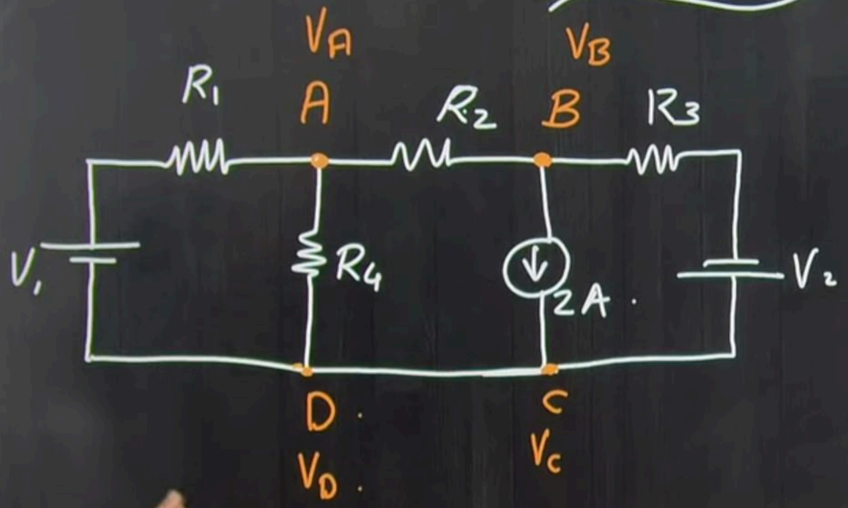
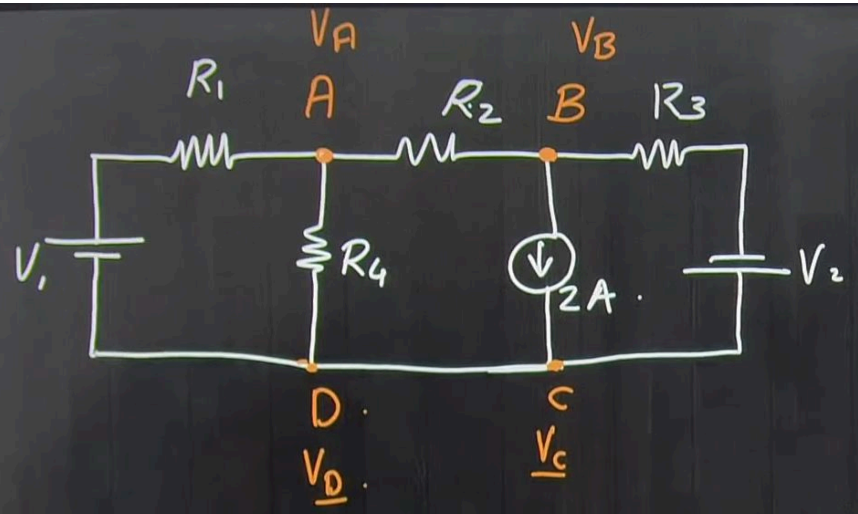
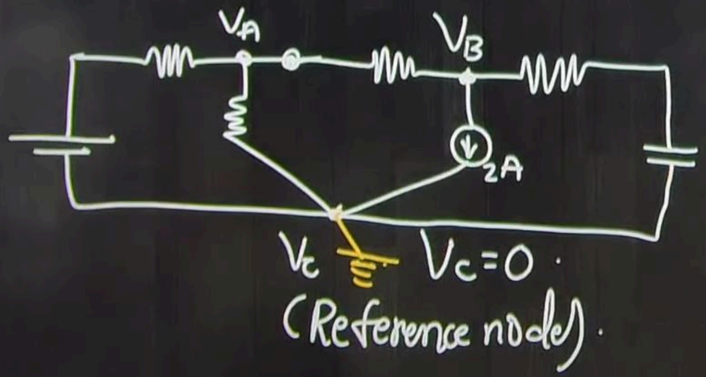
Nodal analysis:



① Identify nodes.





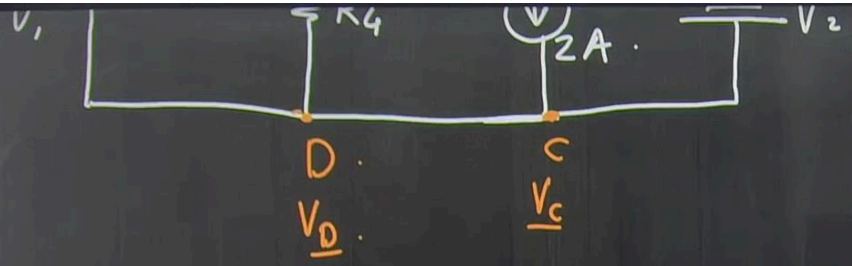
① Identify nodes.

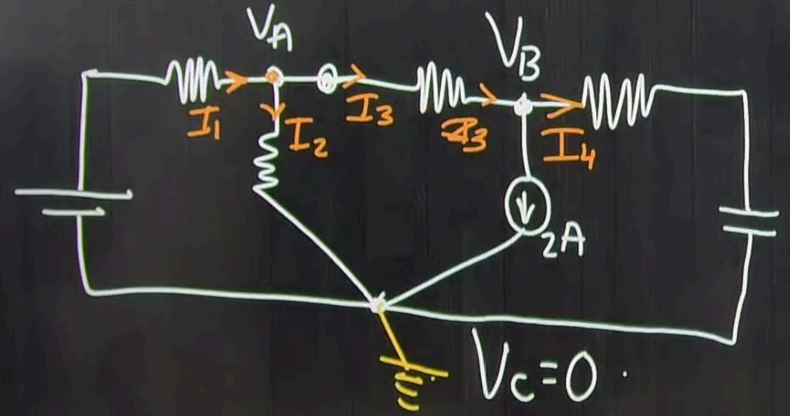
② Reference node

Datum node.

Zero potential

③ Nodes naming.





Zero potential

07:44

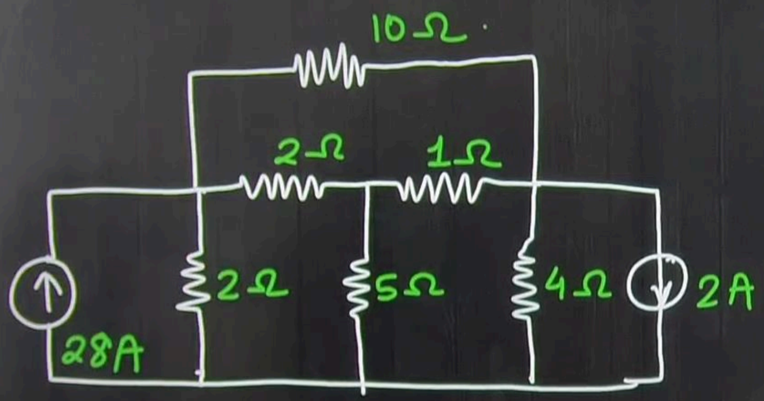
③ Nodes naming.

④ Branch currents & direction I_1, I_2, I_3 — . . .

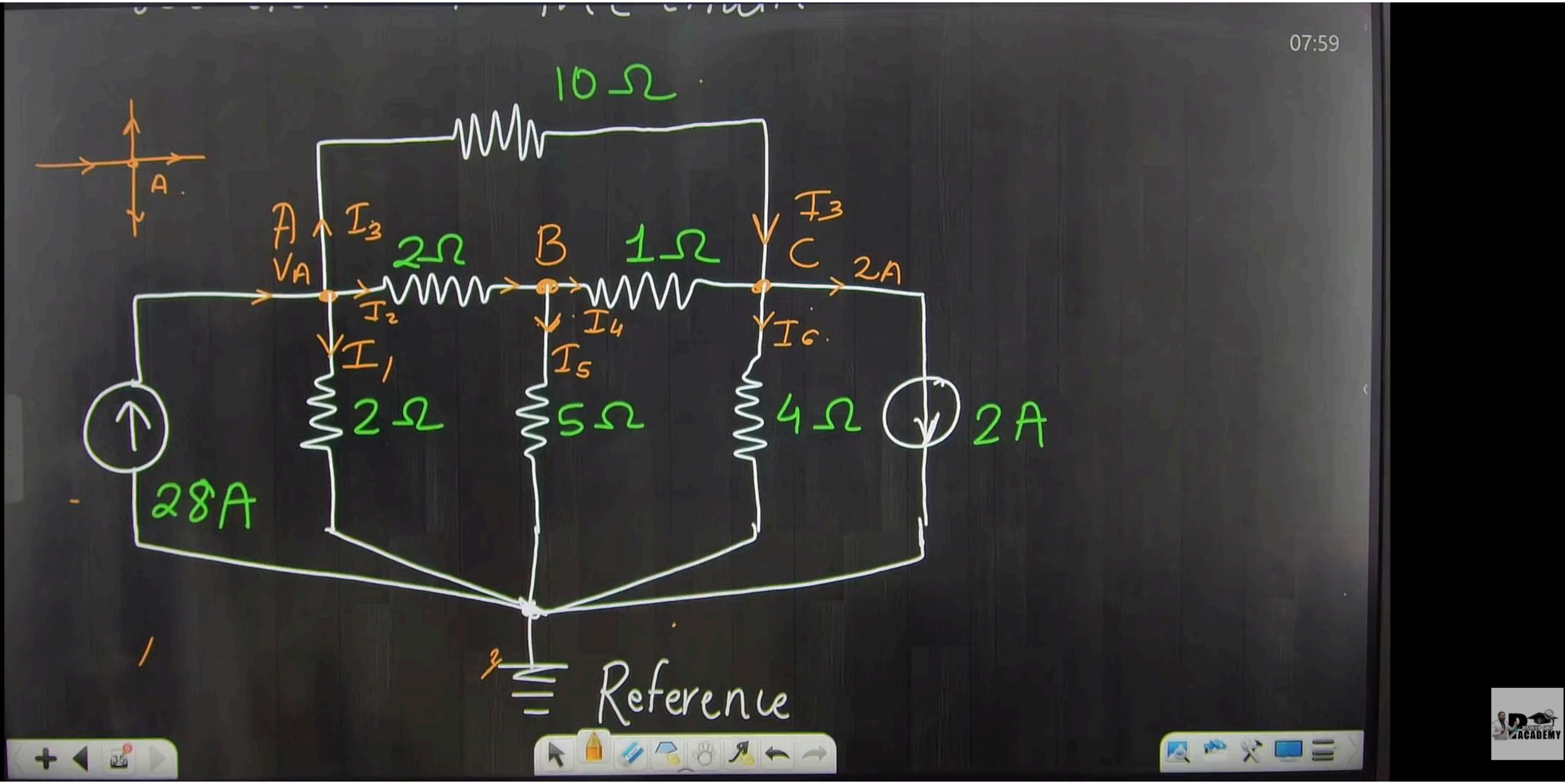
⑤ $I = \frac{V}{R}$.

⑥ Calculation of V.

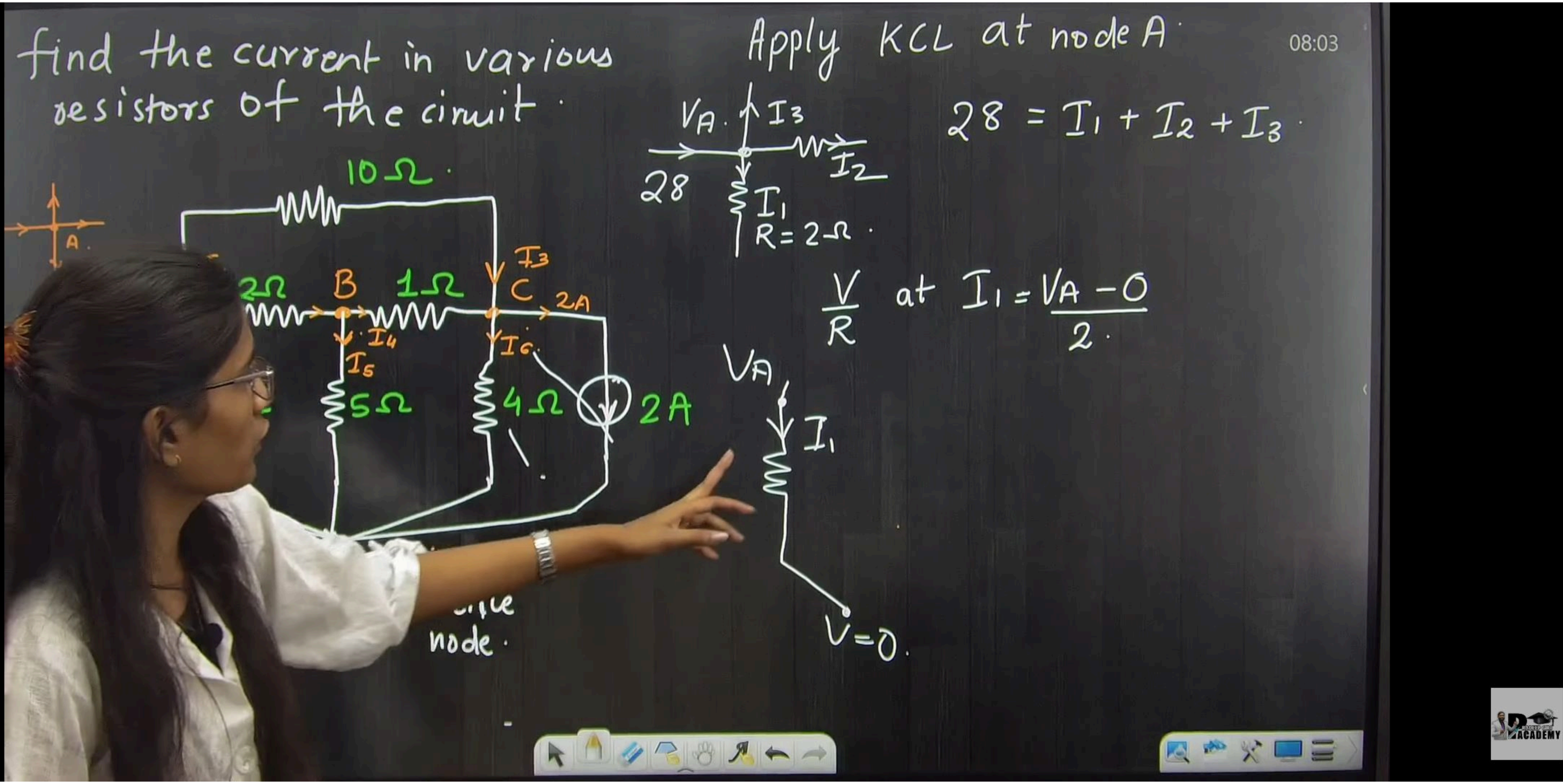
find the current in various resistors of the circuit.



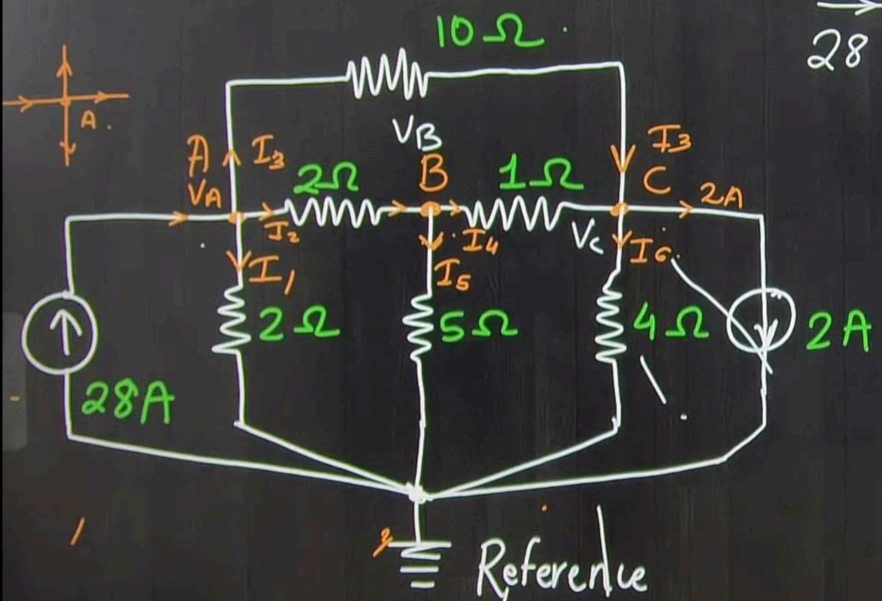
07:52



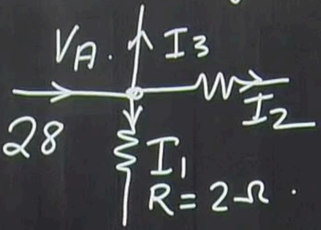
07:59
10Ω
A
A
I_3
V_A
2Ω
B
1Ω
I_3
C
2A
I_2
I_4
I_1
I_5
I_6
2Ω
5Ω
4Ω
2A
28A
Reference
ACADEMY


08:03
find the current in various resistors of the circuit.
10Ω
A
2Ω
B
1Ω
C
I3
2A
I4
I5
I6
5Ω
4Ω
2A
node.
Apply KCL at node A.
VA
I3
28
I2
I1
R = 2Ω.
28 = I1 + I2 + I3.
V/R at I1 = (VA − 0)/2.
VA
I1
V = 0.
ACADEMY

find the current in various resistors of the circuit.



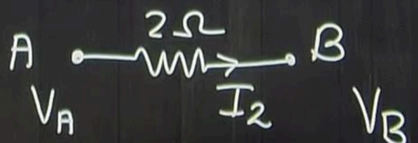
Apply KCL at node A.



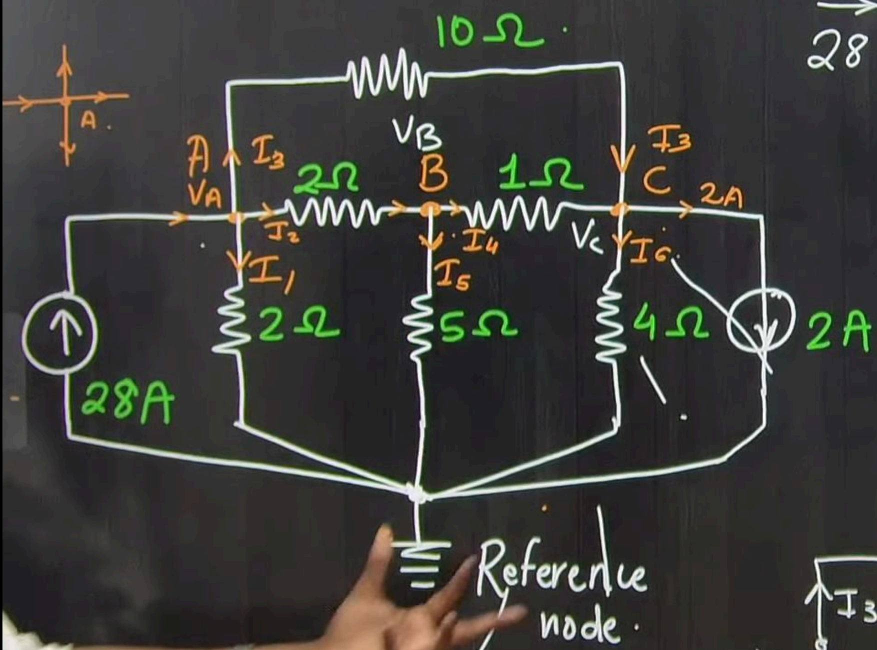
$$28 = I_1 + I_2 + I_3$$

$\frac{V}{R}$ at $\boxed{I_1 = \frac{V_A - 0}{2}}$

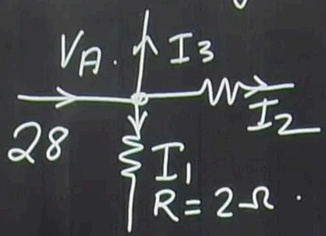
$\frac{V}{R}$ at $I_2 = \frac{V_A - V_B}{2}$



find the current in various resistors of the circuit.



Apply KCL at node A.

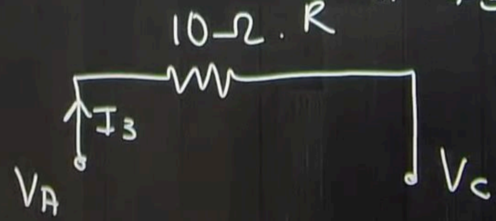


$$28 = I_1 + I_2 + I_3$$

$\frac{V}{R}$ at $\boxed{I_1 = \frac{V_A - 0}{2}}$

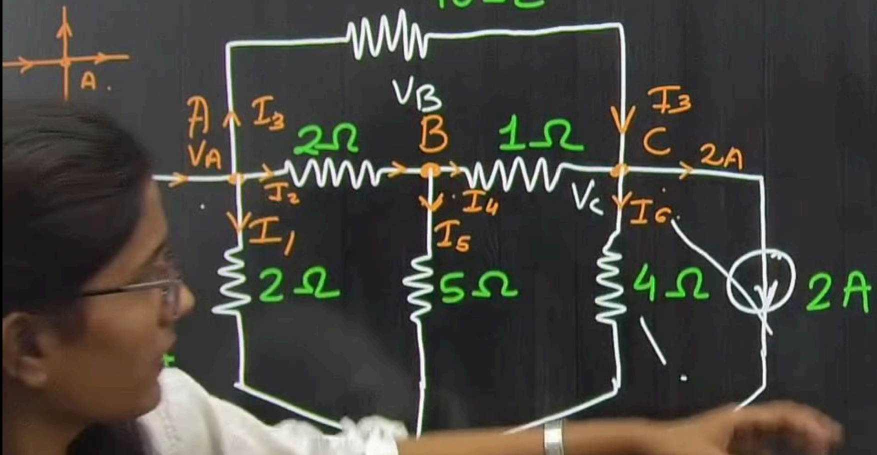
$\frac{V}{R}$ at $I_2 = \frac{V_A - V_B}{2}$

$\frac{V}{R}$ at $I_3 = \frac{V_A - V_C}{10}$



08:07

find the current in various resistors of the circuit.



≡ Reference node.

Apply KCL at node A.

$$28 = I_1 + I_2 + I_3.$$

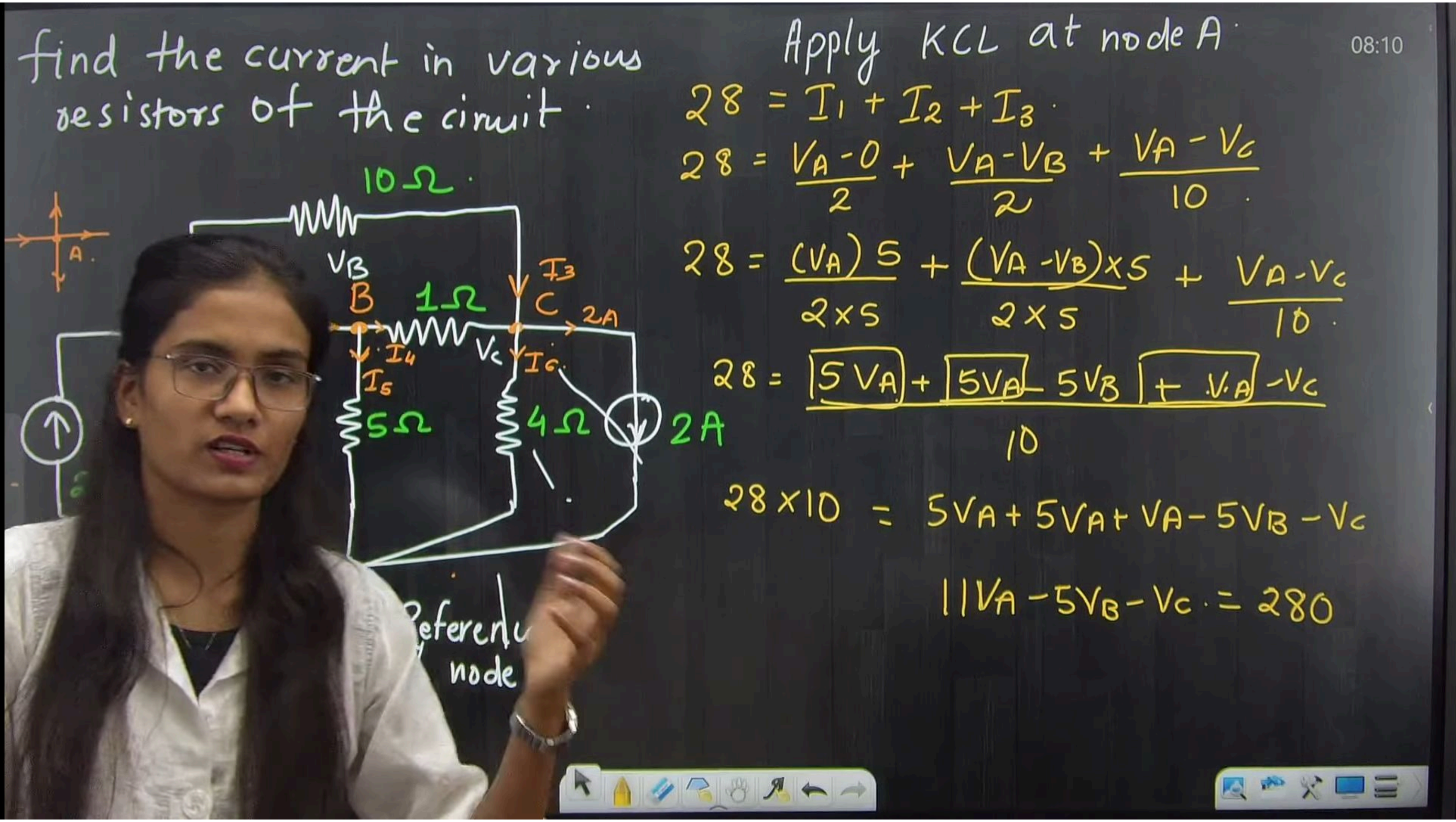
$$28 = \frac{V_A - 0}{2} + \frac{V_A - V_B}{2} + \frac{V_A - V_C}{10}.$$

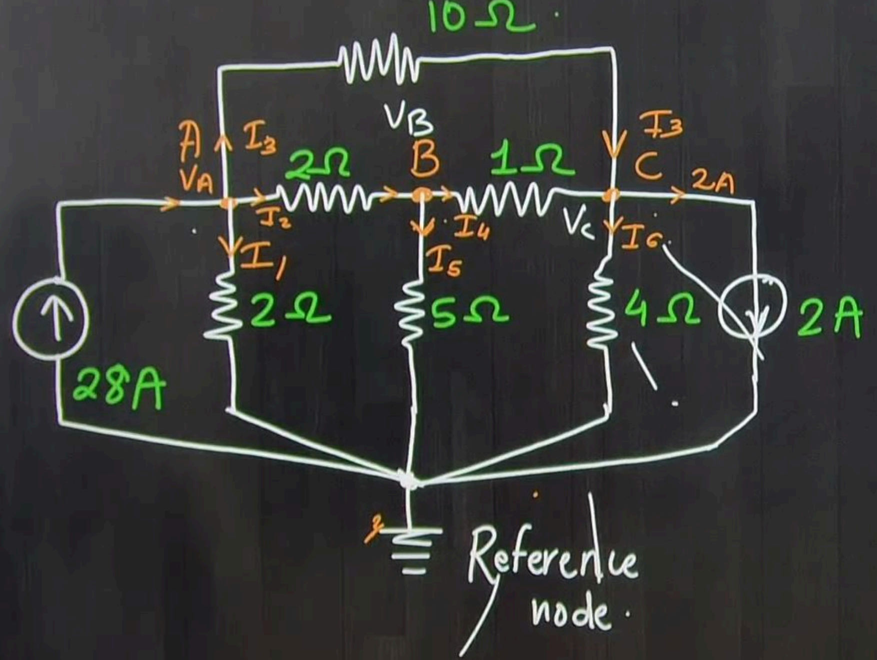
$\frac{V}{R}$ at $\boxed{I_1 = \frac{V_A - 0}{2}}$

$\frac{V}{R}$ at $I_2 = \frac{V_A - V_B}{2}$

$\frac{V}{R}$ at $I_3 = \frac{V_A - V_C}{10}$

08:08


find the current in various resistors of the circuit.
10Ω
A
V_B
I_3
B 1Ω C 2A
I_4
V_c
I_6
I_5
5Ω
4Ω
2A
node
Apply KCL at node A
$28 = I_1 + I_2 + I_3$
$28 = \frac{V_A - 0}{2} + \frac{V_A - V_B}{2} + \frac{V_A - V_C}{10}$
$28 = \frac{(V_A)5}{2\times 5} + \frac{(V_A - V_B)\times 5}{2\times 5} + \frac{V_A - V_C}{10}$
$28 = \frac{\boxed{5V_A} + \boxed{5V_A} - 5V_B \boxed{+ V_A} - V_C}{10}$
$28\times 10 = 5V_A + 5V_A + V_A - 5V_B - V_C$
$11V_A - 5V_B - V_C = 280$
08:10



$$11V_A - 5V_B - V_C = 280 \quad \text{—} \quad (1)$$

Apply KCL at node B

$$I_2 = I_4 + I_5$$

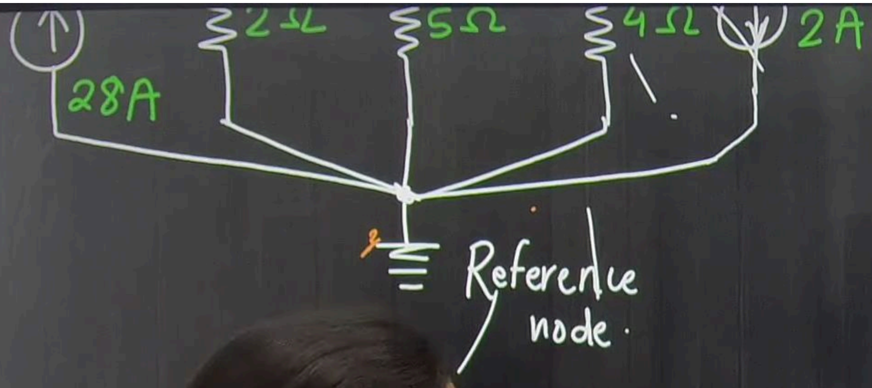
$$\frac{V_A - V_B}{2} = \frac{V_B - V_C}{1} + \frac{V_B - 0}{5}$$

$$\frac{V_A - V_B}{2} = \frac{(V_B - V_C) \times 5}{1 \times 5} + \frac{V_B}{5}$$

$$\frac{V_A - V_B}{2} = \frac{5V_B - 5V_C + V_B}{5}$$

$$\frac{V_A - V_B}{2} = \frac{6V_B - 5V_C}{5}$$

$$5(V_A - V_B) = 2(6V_B \ldots$$



$$\frac{V_A - V_B}{2} = \frac{(V_B - V_C)\times 5}{1\times 5} + \frac{V_B}{5}$$

$$\frac{V_A - V_B}{2} = \frac{5V_B - 5V_C + V_B}{5}$$

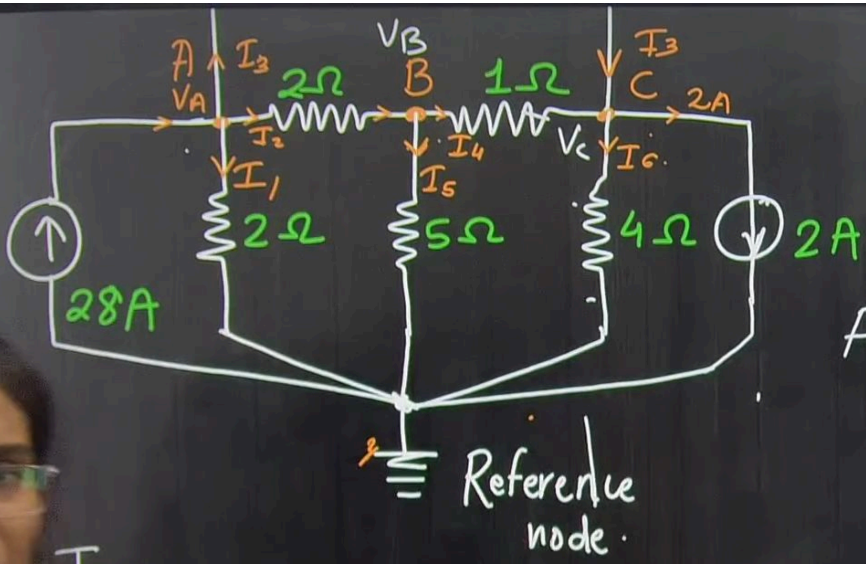
$$\frac{V_A - V_B}{2} = \frac{6V_B - 5V_C}{5}$$

$$5(V_A - V_B) = 2(6V_B - 5V_C)$$

$$5V_A - 5V_B = 12V_B - 10V_C$$

$$5V_A - 5V_B - 12V_B + 10V_C = 0$$

$$5V_A - 17V_B + 10V_C = 0 \quad \text{—— } (2)$$



$$5V_A - 5V_B = 12V_B - 10V_C$$

$$5V_A - 5V_B - 12V_B + 10V_C = 0$$

$$\boxed{5V_A - 17V_B + 10V_C = 0} \text{ — (2)}$$

Apply KCL at node V_C.

$$I_4 + I_3 = I_6 + 2$$

$$\frac{V_B - V_C}{1} + \frac{V_A - V_C}{10} = \frac{V_C - 0}{4} + 2$$

$$\boxed{V_A + 10V_B - 13.5V_C = 20} \text{ — (3)}$$

$x = V_A = 36V$

$y = V_B = 20V$

$z = V_C = 16V$

$I_1 =$

08:28

Reference node.

$$I_1 = \frac{V_A}{2} = \frac{36}{2} = 18A$$

$$I_2 = \frac{V_A - V_B}{2} = \frac{36-20}{2} = 8A.$$

$$I_3 = \frac{V_A - V_C}{10} = \frac{36-16}{10} = 2A.$$

$$I_4 = \frac{V_B - V_C}{1} = \frac{20-16}{1} = 4A$$

$$I_5 = \frac{V_B - 0}{5} = \frac{20-0}{5} = 4A.$$

$$I_6 = \frac{V_C - 0}{4} = \frac{16-0}{4} = 4A.$$

$$I_4 + I_3 = I_6 + 2.$$

$$\frac{V_B - V_C}{1} + \frac{V_A - V_C}{10} = \frac{V_C - 0}{4} + 2.$$

$$\boxed{V_A + 10V_B - 13.5V_C = 20} \quad - (3)$$

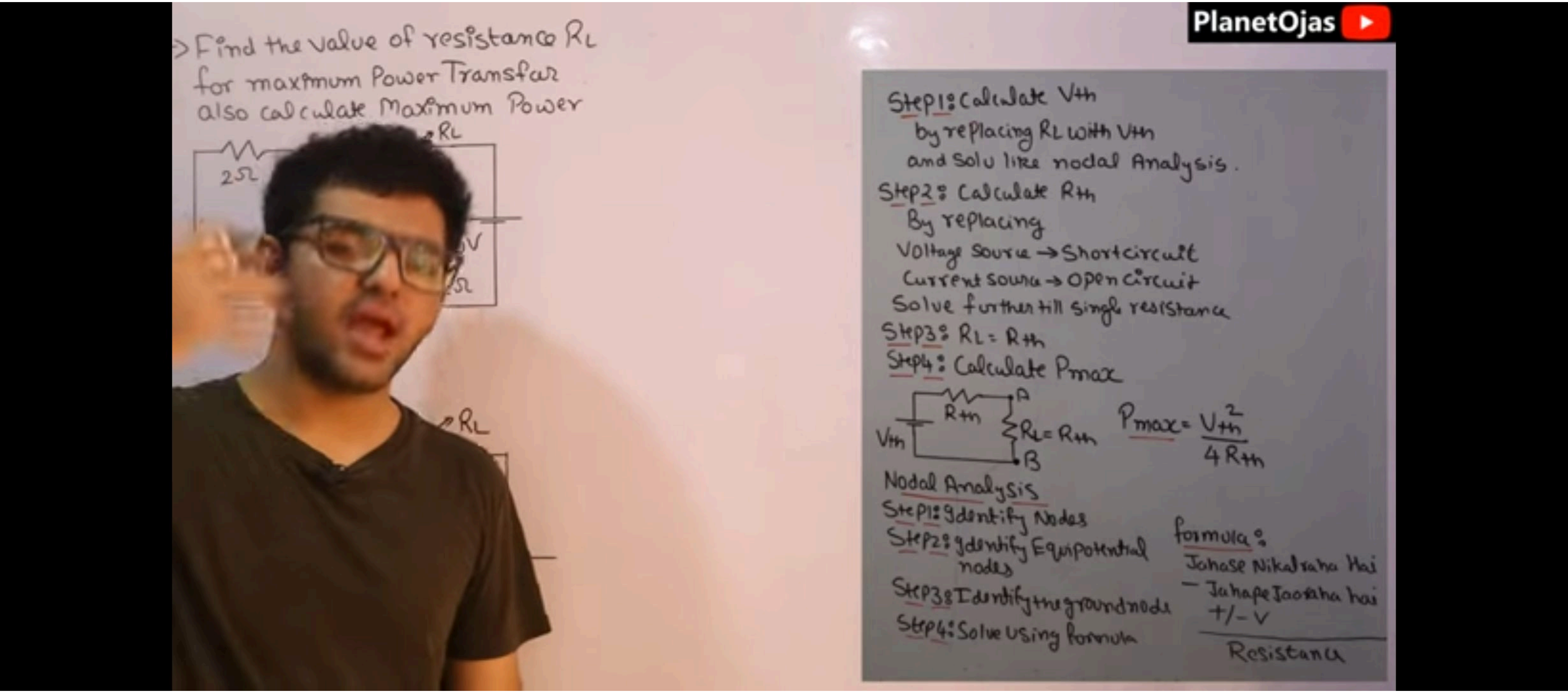
$x = V_A = 36V$

$y = V_B = 20V$

$z = V_C = 16V$

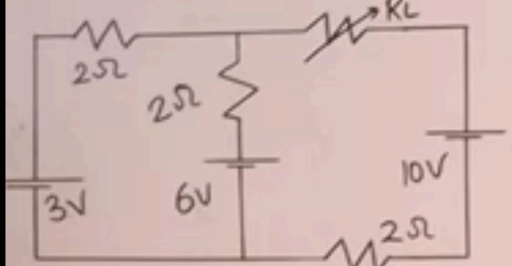
08:31

Maximum Power Transfer Theorem

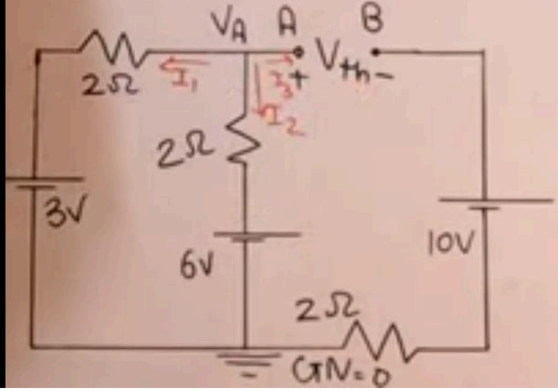

PlanetOjas
=> Find the value of resistance RL
for maximum Power Transfar
also calculate Maximum Power
RL
2Ω
Step1: Calculate Vth
by replacing RL with Vth
and Solu like nodal Analysis.
Step2: Calculate Rth
By replacing
Voltage Source → Shortcircuit
Current Source → Open Circuit
Solve further till single resistance
Step3: RL = Rth
Step4: Calculate Pmax
Rth
A
B
Vth
RL = Rth
Pmax = Vth^2 / 4 Rth
Nodal Analysis
Step1: Identify Nodes
Step2: Identify Equipotential nodes
Step3: Identify the ground node
Step4: Solve using formula
formula:
Jahase Nikalraha Hai
− Jahape Jaaraha hai
+/− V
Resistance

PlanetOjas

> Find the value of resistance R_L for maximum Power Transfar also calculate Maximum Power



Step1: calculating V_{th}



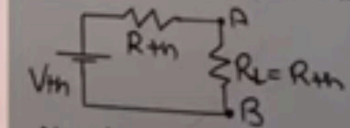
Applying KCl to VA

Step1: Calculate V_{th} by replacing R_L with V_{th} and Solu like nodal Analysis.

Step2: Calculate R_{th} By replacing
Voltage Source → Shortcircuit
Current source → Open circuit
Solve further till single resistance

Step3: $R_L = R_{th}$

Step4: Calculate P_{max}



$$P_{max} = \frac{V_{th}^2}{4R_{th}}$$

Nodal Analysis

Step1: Identify Nodes

Step2: Identify Equipotential nodes

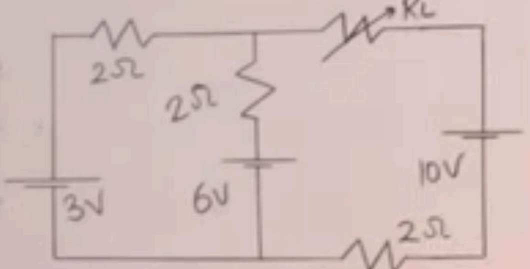
Step3: Identify the ground node

Step4: Solve Using formula

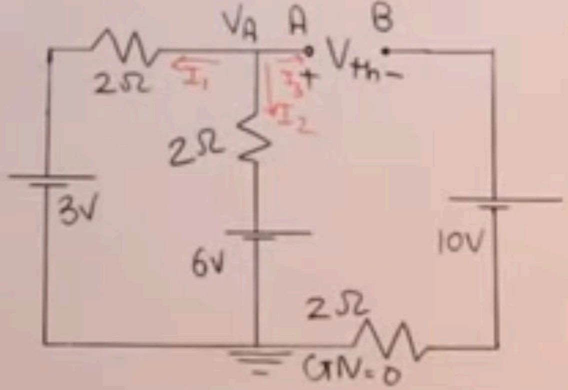
formula:

$$\frac{\text{Jahase Nikalraha Hai} - \text{Jahape Jaoraha hai} \; +/- V}{\text{Resistance}}$$

⇒ Find the value of resistance R_L for maximum Power Transfer also calculate Maximum Power



Step 1: calculating V_{th}



Applying KCl to VA

$$\frac{V_A-3}{2}+\frac{V_A-6}{2}=0$$

$$\frac{V_A-3+V_A-6}{2}=0$$

$$2V_A-9=0$$

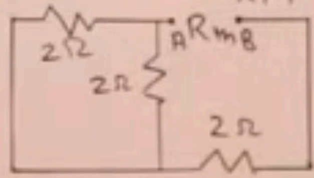
$$V_A=\frac{9}{2}=4.5V$$

Writing eqⁿ for V_{th}

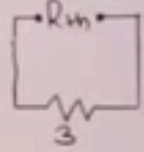
$$V_A-V_{th}-10=0$$

$$V_{th}=V_A-10$$
$$=4.5-10$$
$$=-5.5$$
$$=5.5 \text{ (terminal B is + w.r.t A)}$$

Step 2: Calculate R_{th}



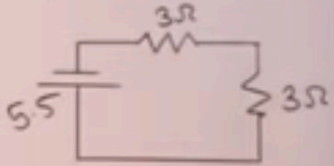
$2 \| 2 = 2\times2/2+2 = 1$



$R_{th}=1+2=3\Omega$

Step 3: $R_L=R_{th}=3\Omega$

Step 4: Calculate P_{max}



$$P_{max}=\frac{V_{th}^2}{4R_{th}}=\frac{(5.5)^2}{4(3)}$$

$$=2.52W$$