SNS COLLEGE OF TECHNOLOGY
Coimbatore-35
An Autonomous Institution

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

23ECB101 – CIRCUIT ANALYSIS AND DEVICES

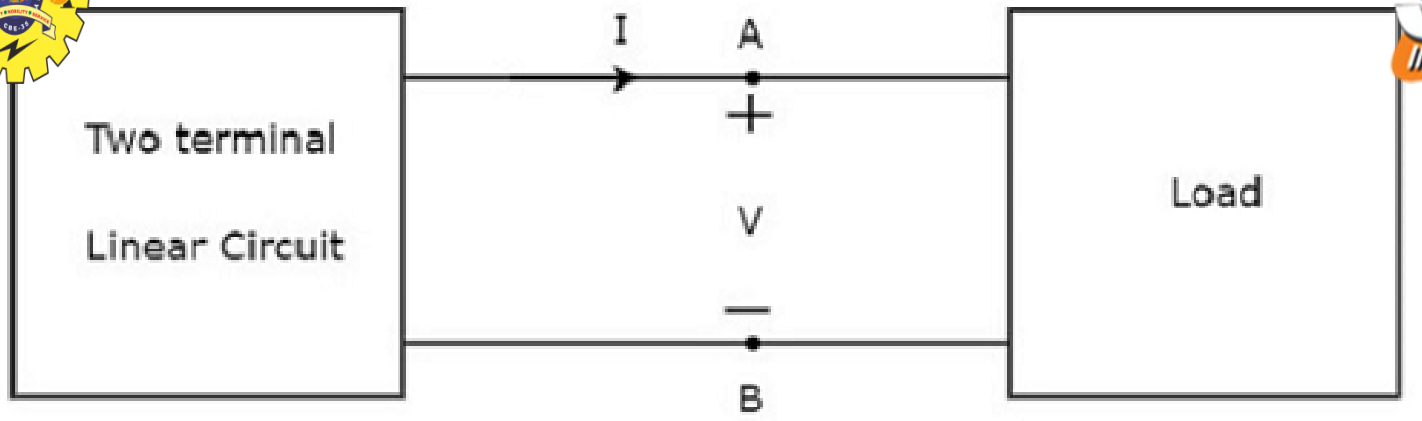
I YEAR/ II SEMESTER

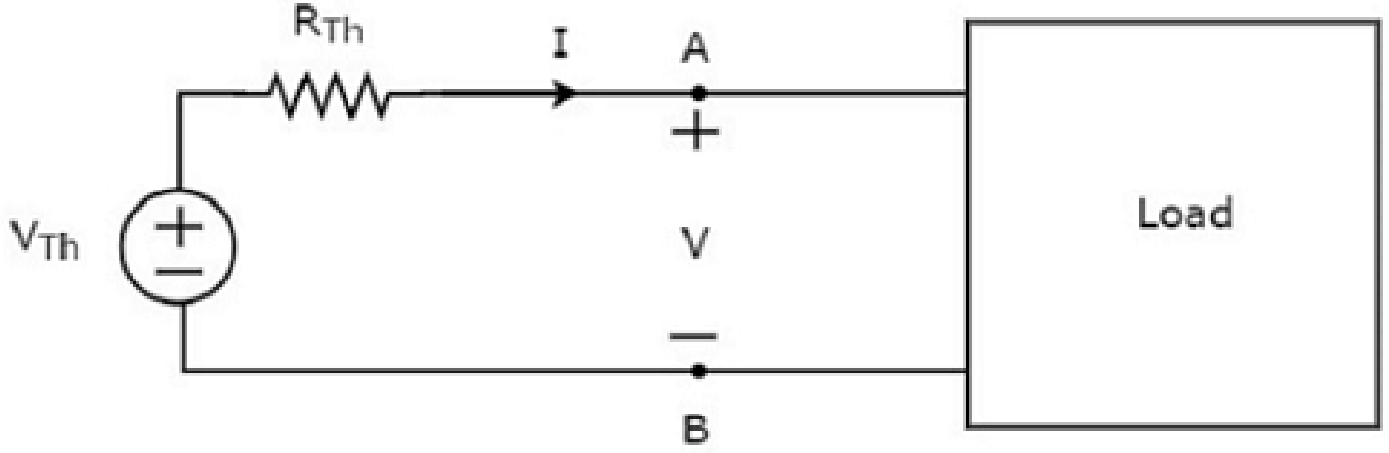
UNIT 2 – NETWORK THEOREMS AND SOURCE TRANSFORMATION

TOPIC - Thevenin Theorem

THEVENIN THEOREM

Any linear, two terminal, bilateral active network can be replaced by a voltage source of thevenins voltage Vth in series with a thevenins resistance Rth. Vth is the open circuit voltage across the terminals & Rth is the effective resistance looking back from the terminals.





Thevenin Equivalent Circuit

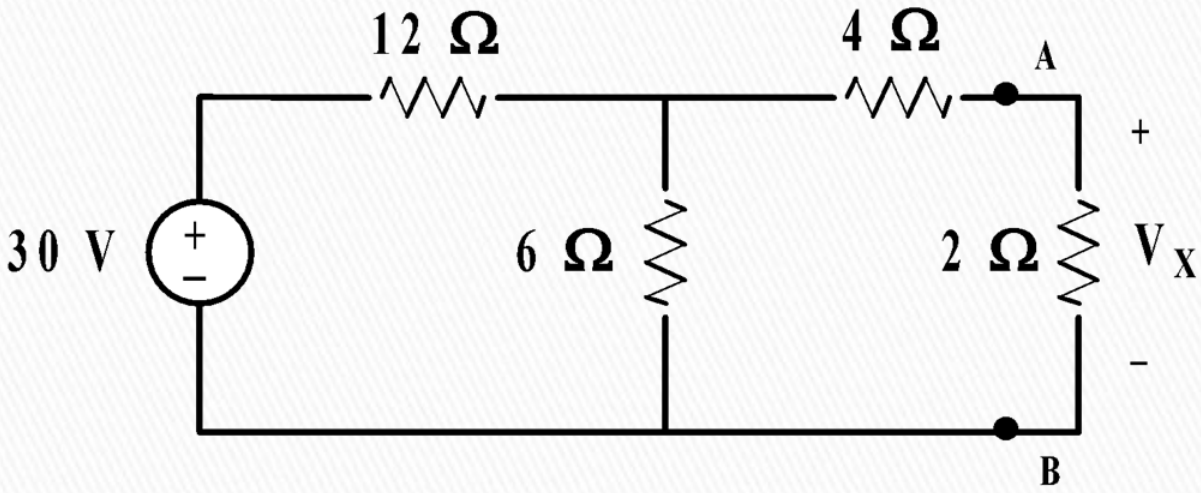
Steps involved in solving a problem using thevenins theorem:

- **Step 1** − Consider the circuit diagram by opening the terminals with respect to which the Thevenin's equivalent circuit is to be found.
- **Step 2** − Find Thevenin's voltage $\mathbf{V_{Th}}$ across the open terminals of the above circuit.

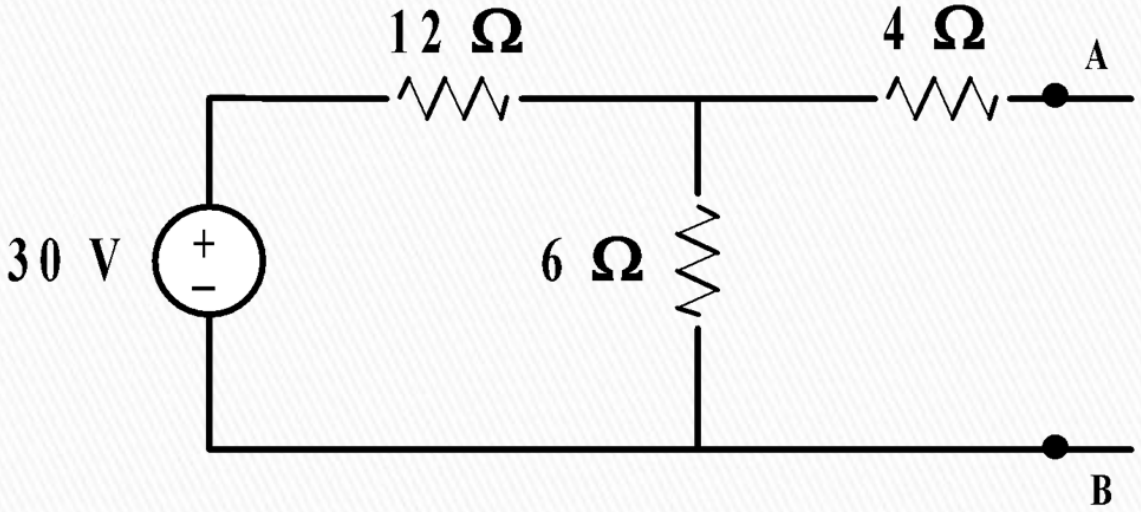
- **Step 3** − Find Thevenin's resistance $\mathbf{R_{Th}}$ across the open terminals of the above circuit by eliminating the independent sources present in it.
- **Step 4** − Draw the **Thevenin's equivalent circuit** by connecting a Thevenin's voltage V_{Th} in series with a Thevenin's resistance R_{Th}.

Example

Find V_X by first finding V_{TH} and R_{TH} to the left of A-B.

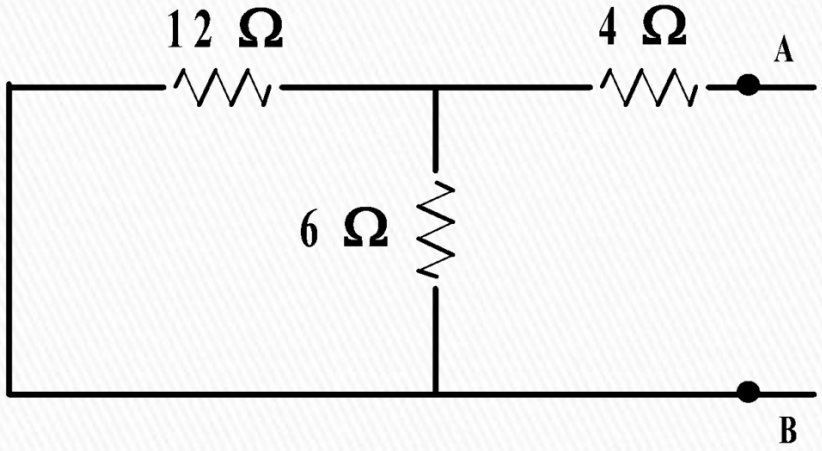


First remove everything to the right of A-B.



Circuit for finding V_{TH}

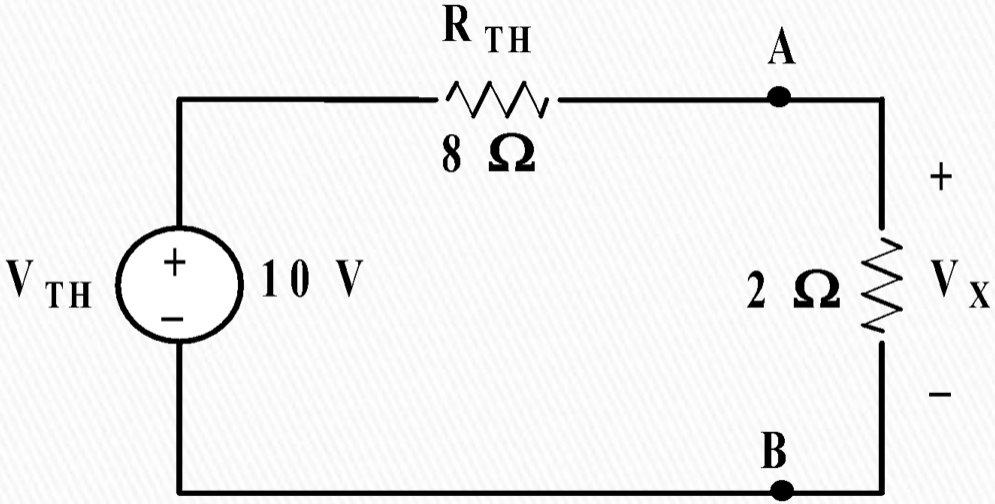
$$V_{AB} = \frac{(30)(6)}{6+12} = 10V$$



Circuit for finding R_{TH}

$$R_{TH} = 12||6 + 4 = 8\ \Omega$$

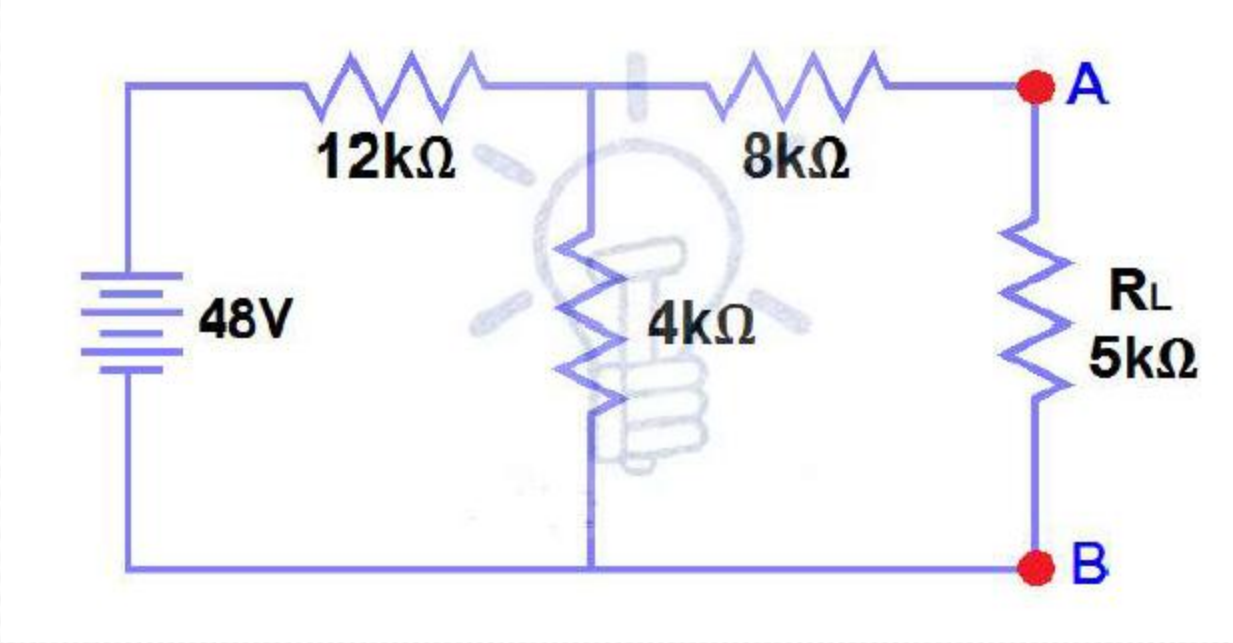
After having found the Thevenin circuit, connect this to the load in order to find V_X.

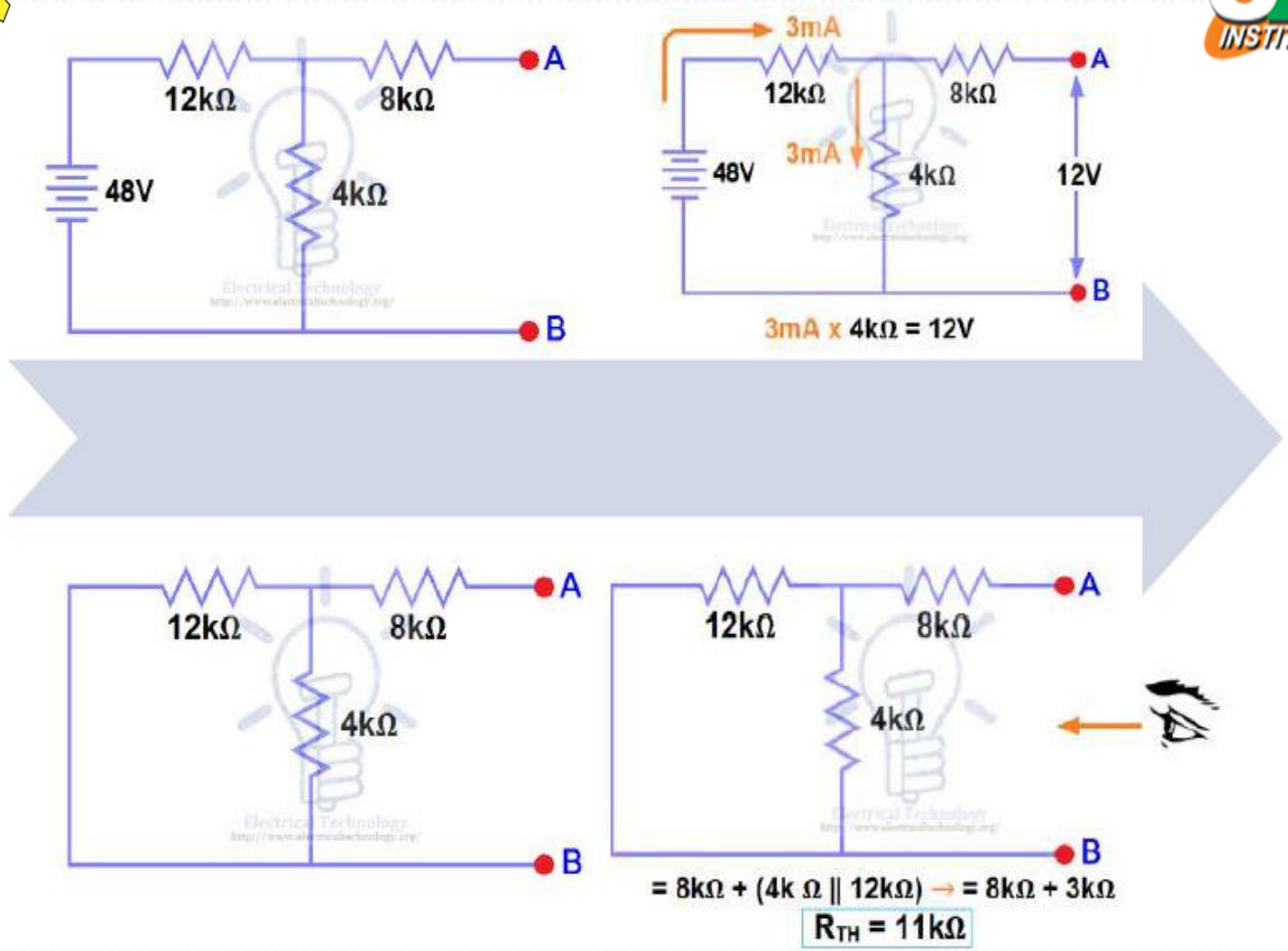


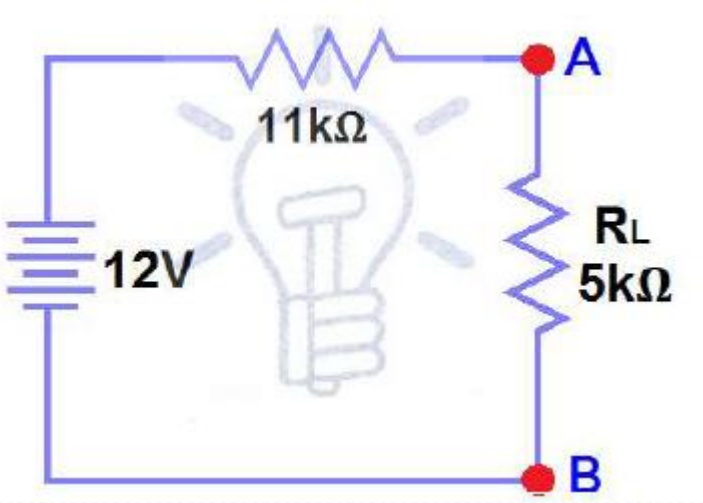
$$V_X = \frac{(10)(2)}{2+8} = 2V$$

xample

- Find VTH, RTH and the load current flowing through and load voltage across the load resistor using Thevenin's Theorem.




12kΩ
8kΩ
A
48V
4kΩ
B
3mA
12kΩ
8kΩ
A
3mA
48V
4kΩ
12V
B
3mA x 4kΩ = 12V
12kΩ
8kΩ
A
4kΩ
B
12kΩ
8kΩ
A
4kΩ
B
= 8kΩ + (4k Ω || 12kΩ) → = 8kΩ + 3kΩ
RTH = 11kΩ



Now apply the last step. calculate the total load current & load voltage

IL = VTH/ (RTH + RL)

= 12V / (11kΩ + 5kΩ) → = 12/16kΩ

IL= 0.75mA

And

VL = ILx RL

VL = 0.75mA x 5kΩ

VL= 3.75V

THANK YOU