

## Verification of NETWORK THEOREMS (Thevenin's Theorem)

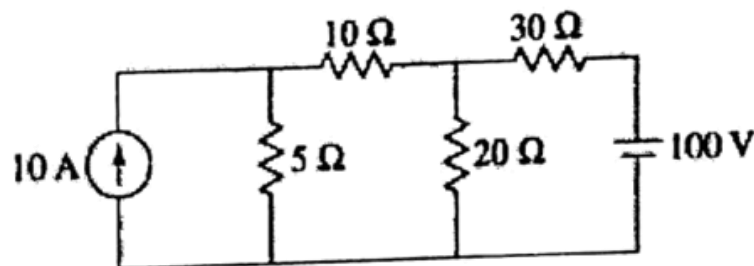
**Aim:** To verify the Thevenin's Theorem for the given network by theoretical values and simulation methods.

**Apparatus/Tool required:**

ORCAD / Capture CIS --> Analog Library - R,  
Source Library - Vdc, Idc &  
Ground (GND) - 0 (zero)

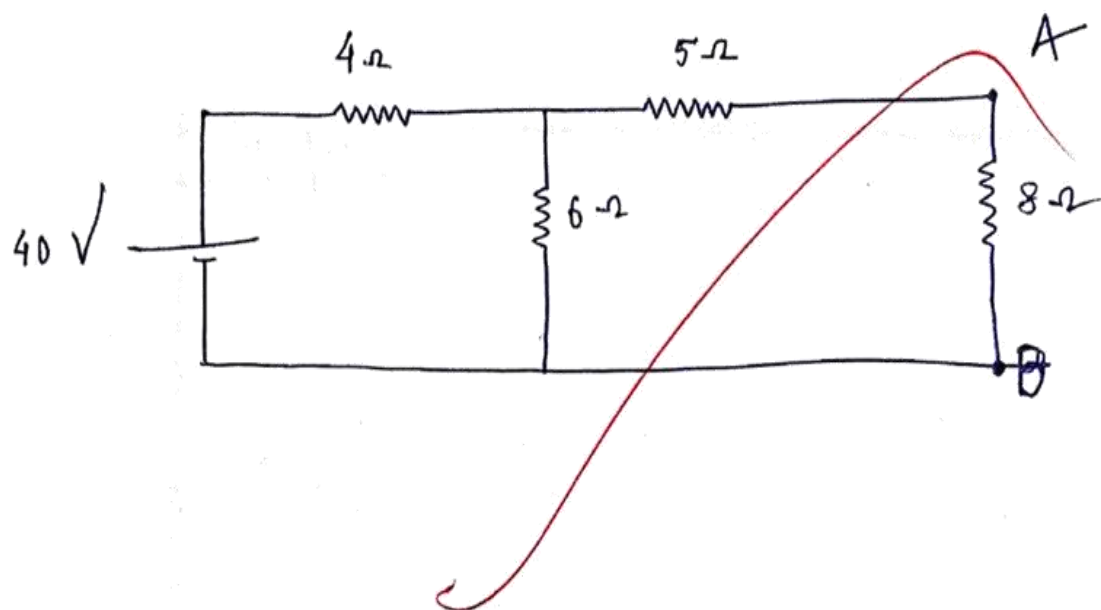
Simulation Settings: Analysis Type - Bias Point

**Circuit Diagram**



**Statement: Thevenin's Theorem**

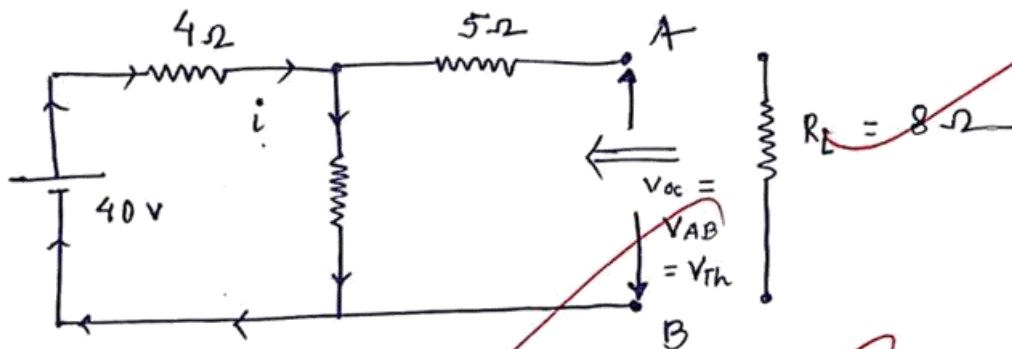
— In a linear bilateral network with output terminals A and B, can be replaced by a single voltage source in series with equivalent resistance.



### Manual Calculations:

To Find  $V_{th}$ :

$$V_{Th} = V_{oc} = V_{AB}$$



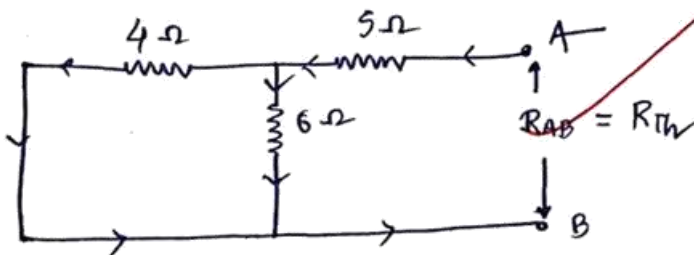
$$i = \frac{V}{R_T} = \frac{40}{4+6} \text{ Amps} = \frac{40}{10} \text{ Amps} = 4 \text{ Amps}$$

$$V_{Th} = V_{oc} = V_{AB} = i_{6\Omega} \times R_{6\Omega}$$

$\therefore$

$$V_{Th} = (4 \times 6) \text{ V} = 24 \text{ Volts}$$

To Find  $R_{th}$ :



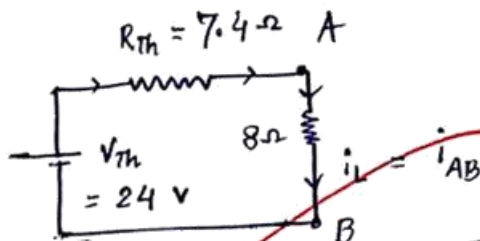
$$R_{Th} = R_{AB} = (4 \parallel 6) + 5 \Omega = \left( \frac{4 \times 6}{4+6} \right) + 5 \Omega$$

$$R_{Th} = \frac{24}{10} + 5 \Omega$$

$$\therefore R_{Th} = 7.4 \Omega$$

To Find  $I_L$ :

Equivalent Circuit



$$i_L = i_{AB} = \frac{V_{Th}}{R_{Th} + R_L}$$

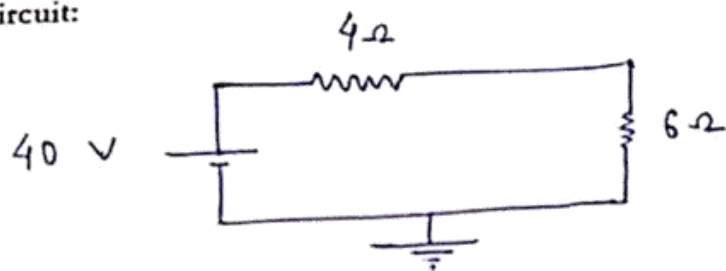
$$= \frac{24}{7.4 + 8} \text{ Amp.}$$

$$= \frac{24}{15.4} \text{ Amp.}$$

$$\therefore i_L = 1.558 \text{ Amps}$$

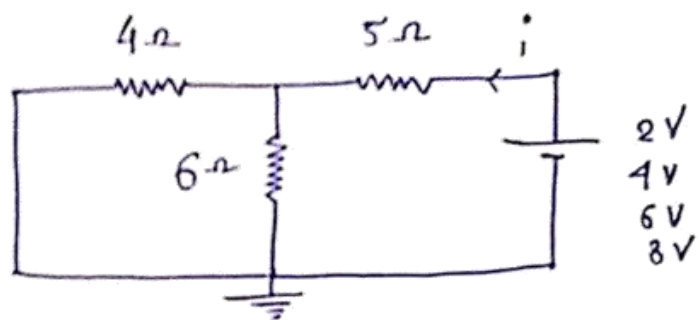
# Simulation Circuit:

To Find  $V_{ab}$ :



$$V_L = 24V$$

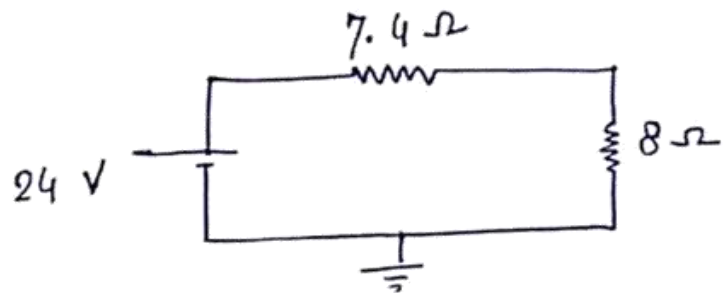
To Find  $R_{ab}$ :



$v$	$i$	$R = \frac{v}{i}$
2	270.3	7.39
4	540.5	7.40
6	810.8	7.40

$$R_{avg} = 7.4\Omega$$

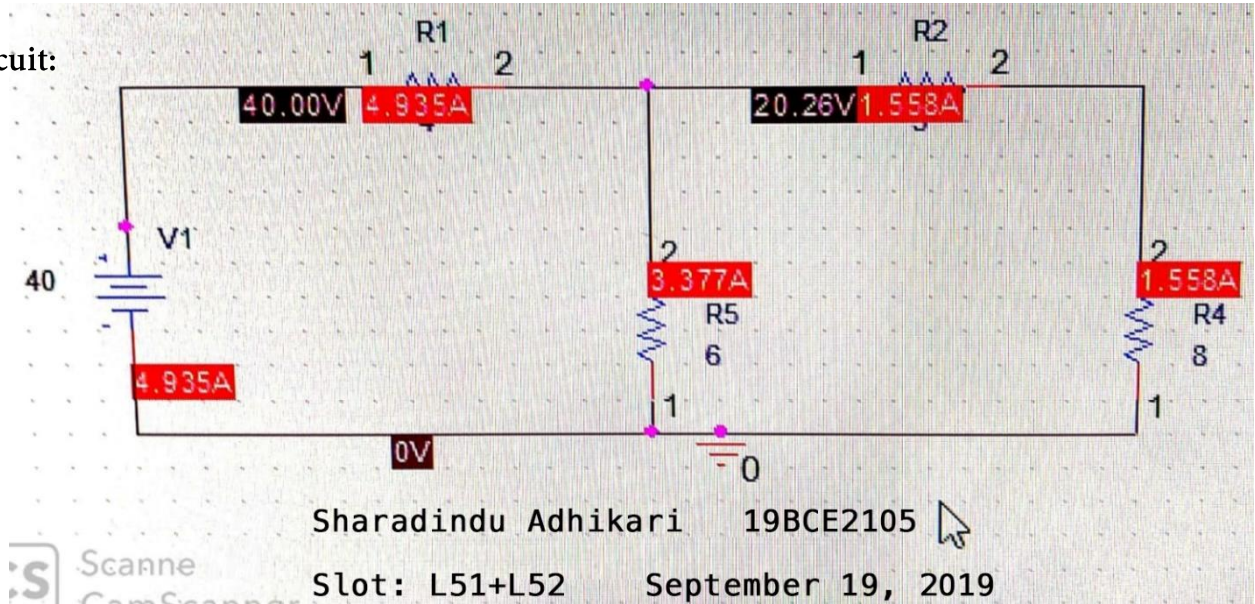
To Find  $I_L$ :



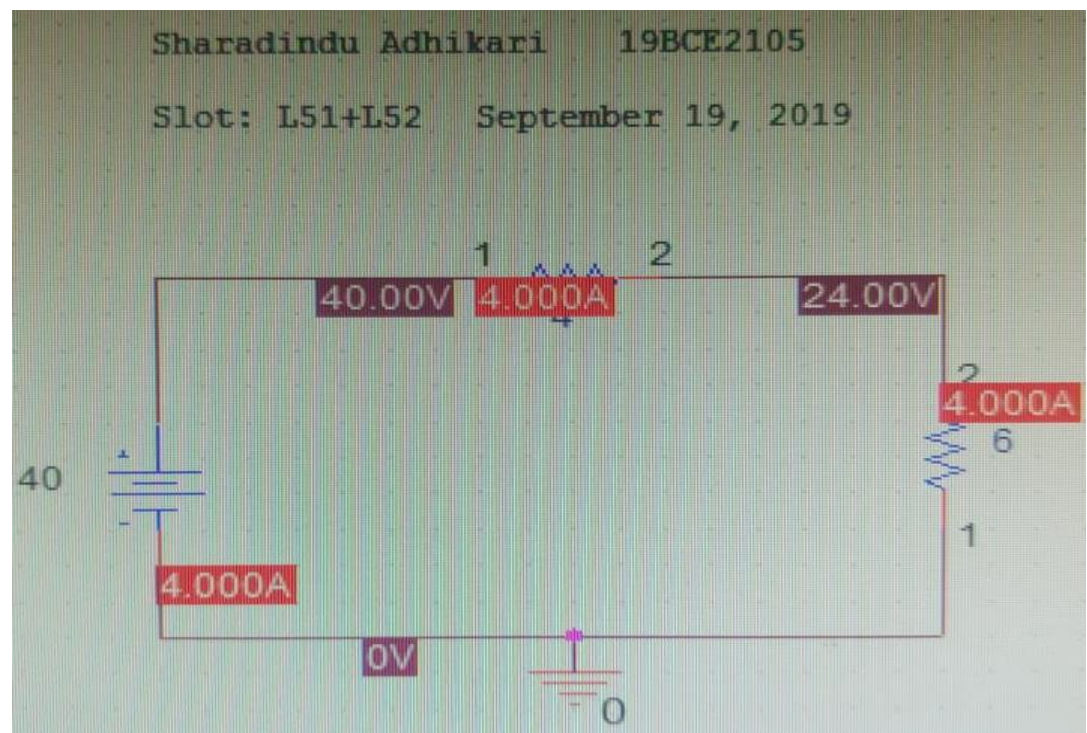
$$I_L = 1.558A$$



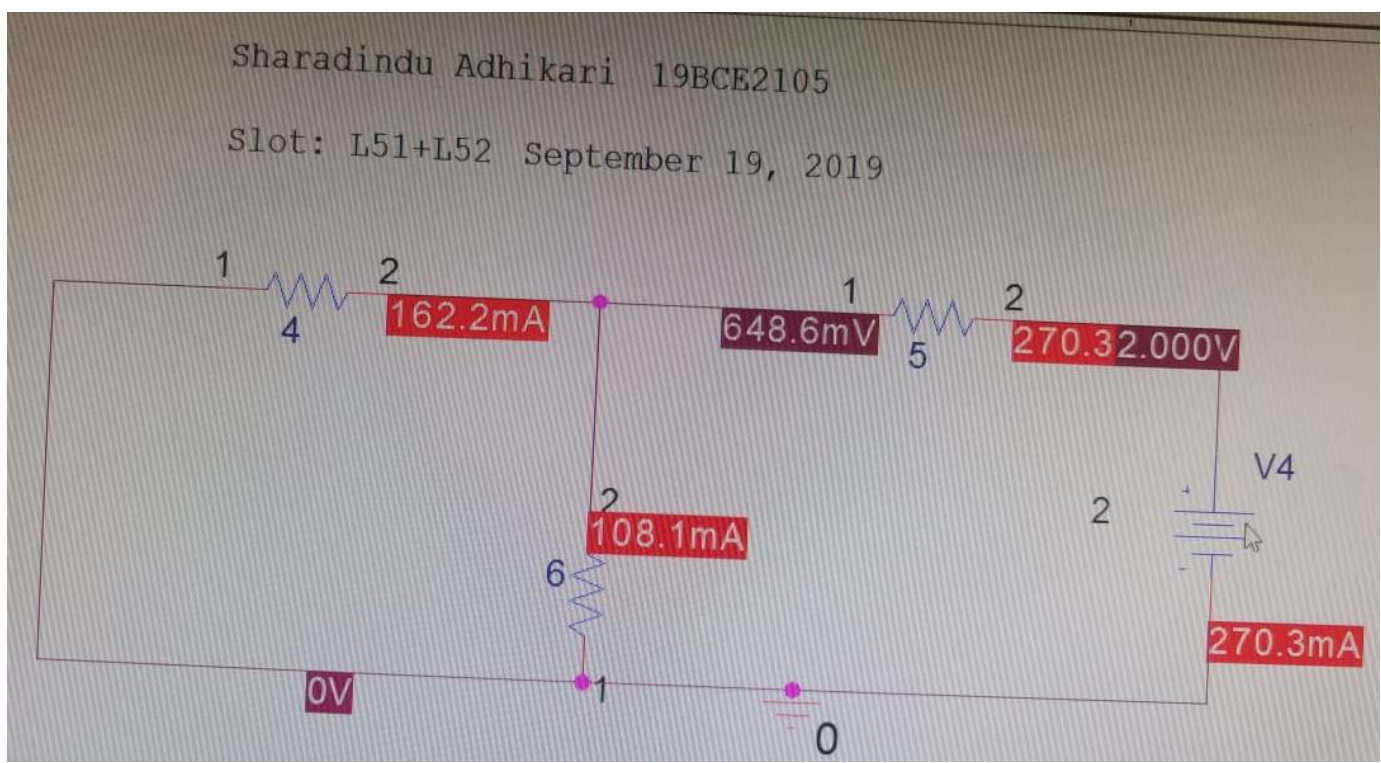
## Simulation Circuit:



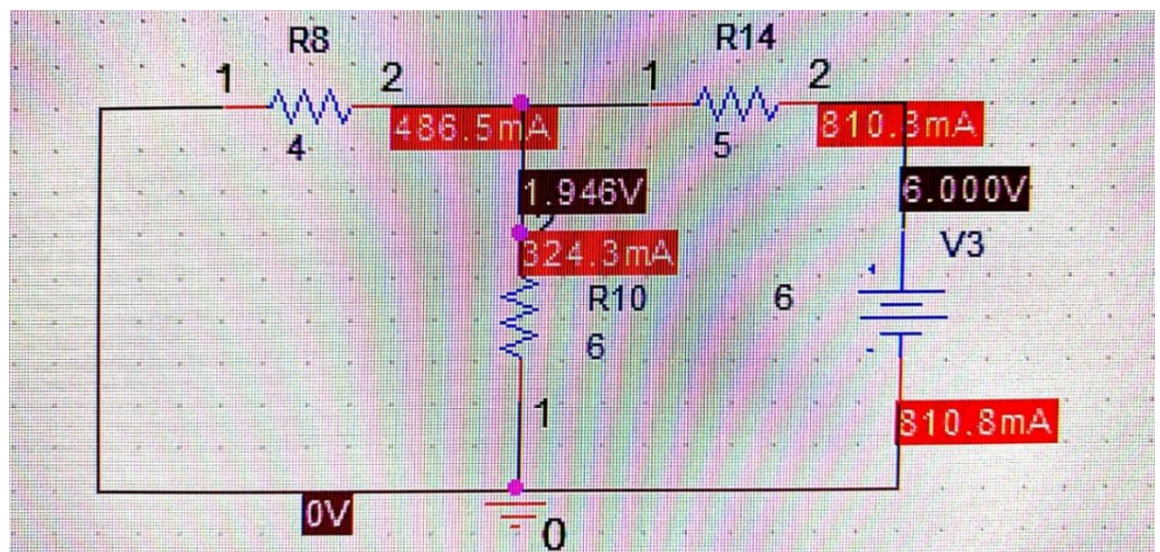
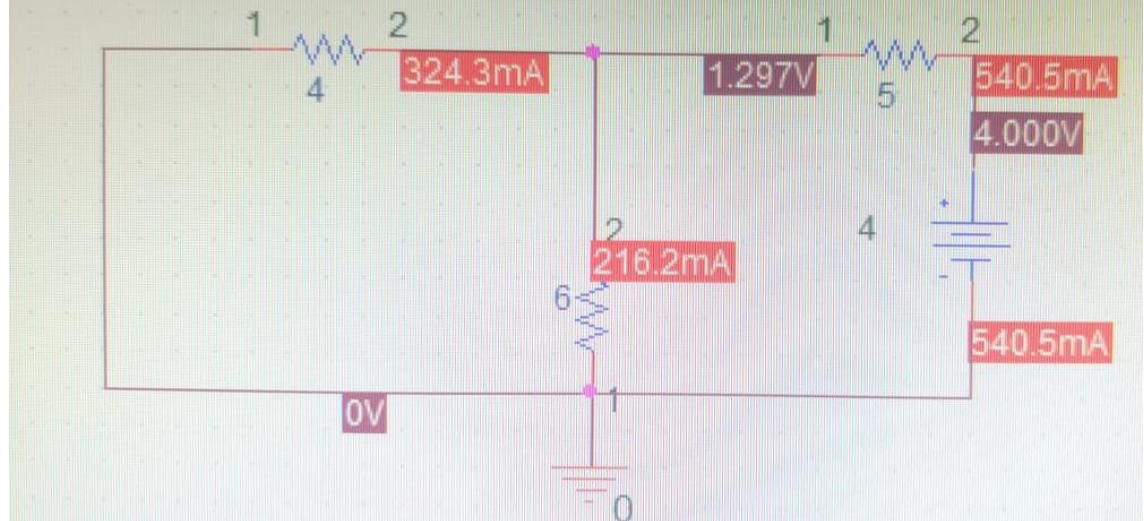
- To find  $V_{th}$ :



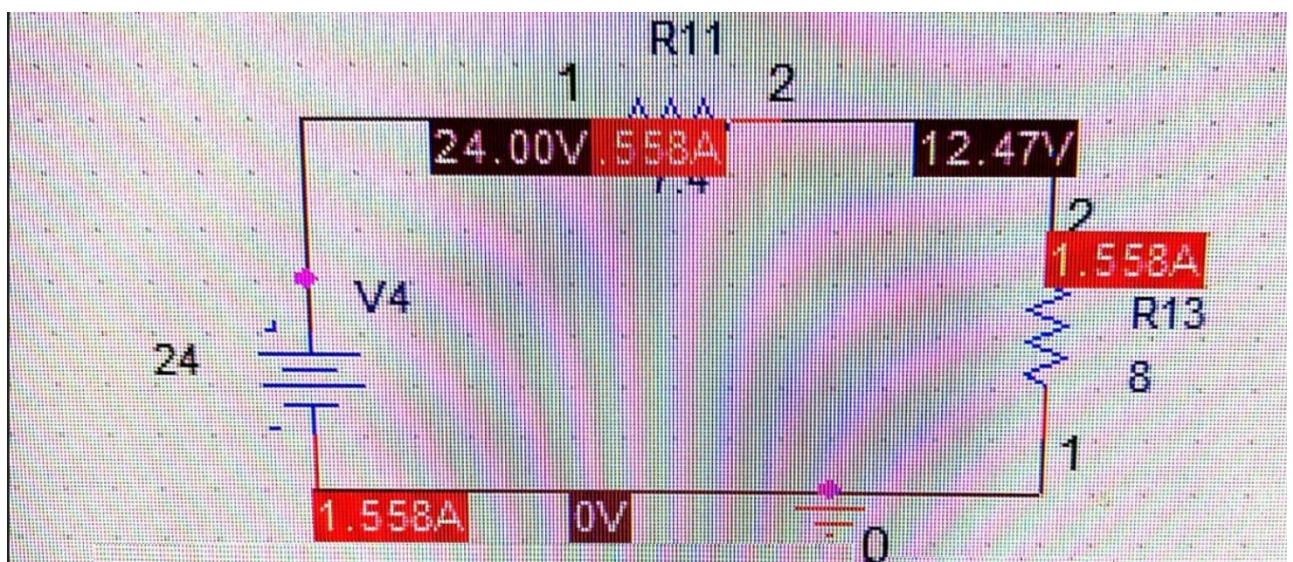
- To find  $R_{th}$ :







- To find  $I_L$ :





Procedure:

Result: The Thevenin's Theorem have been verified for the given network by theoretical & simulation values & the following results are tabulated: Thevenin's Theorem

Manual Calculations

$V_L$  24 V  
 $R_{Th}$  7.4 V  
 $i_L$  1.558 V

Simulated Result

24 V  
7.4 V  
1.558 V

Inference:

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