

Ex. No.: 3

Date: 11/10/2021

## Verification of Thevenin Theorem

---

Aim:

To find Thevenin current with manual calculations and an ORCAD simulation

Apparatus:

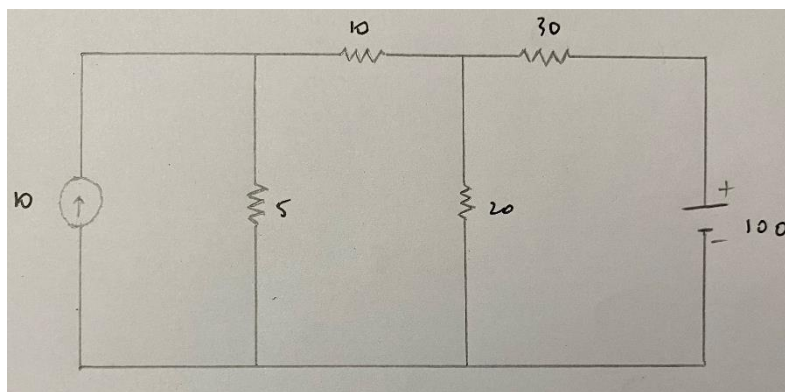
ORCAD / Capture CIS: Analog Library – R

Source Library – Vdc, Idc

Ground (GND) – 0 (zero)

Simulation Settings: Analysis Type – Bias Point

Circuit Diagram for Thevenin Theorem:

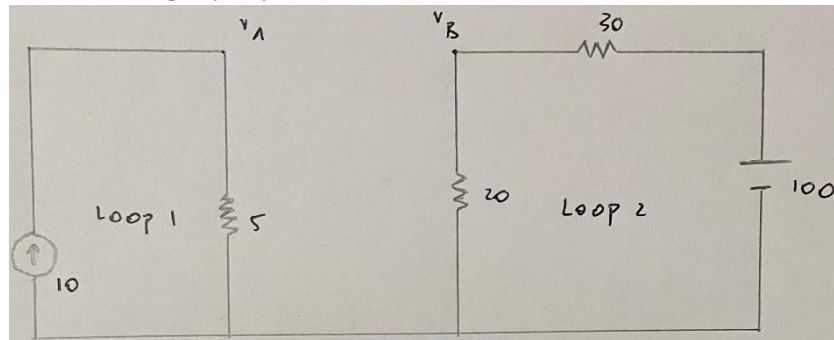


Statement:

Thevenin theorem states that it is possible to simplify any linear circuit to an equivalent circuit with a single voltage source and a series resistance connected with a load.

## Manual Calculations:

Finding Thevenin Voltage ( $V_{th}$ ):



Loop 1

$$V = IR$$

$$\Rightarrow V = 10 \times 5$$

$$\Rightarrow V_A = 50 \text{ V}$$

Loop 2

$$I = \frac{V}{R}$$

$$\Rightarrow I = \frac{100}{20 + 30}$$

$$\Rightarrow I = 2 \text{ A}$$

$$V = IR$$

$$\Rightarrow V_B = +100 - 2 \times 30$$

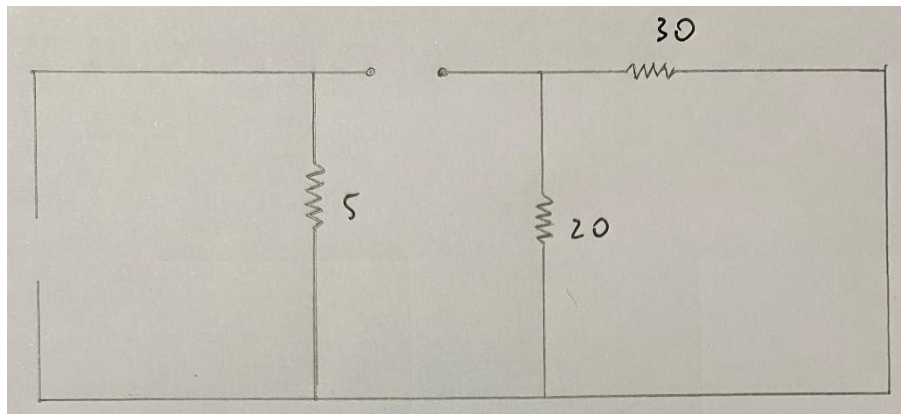
$$\Rightarrow V_B = 100 - 60$$

$$\Rightarrow V_B = 40$$

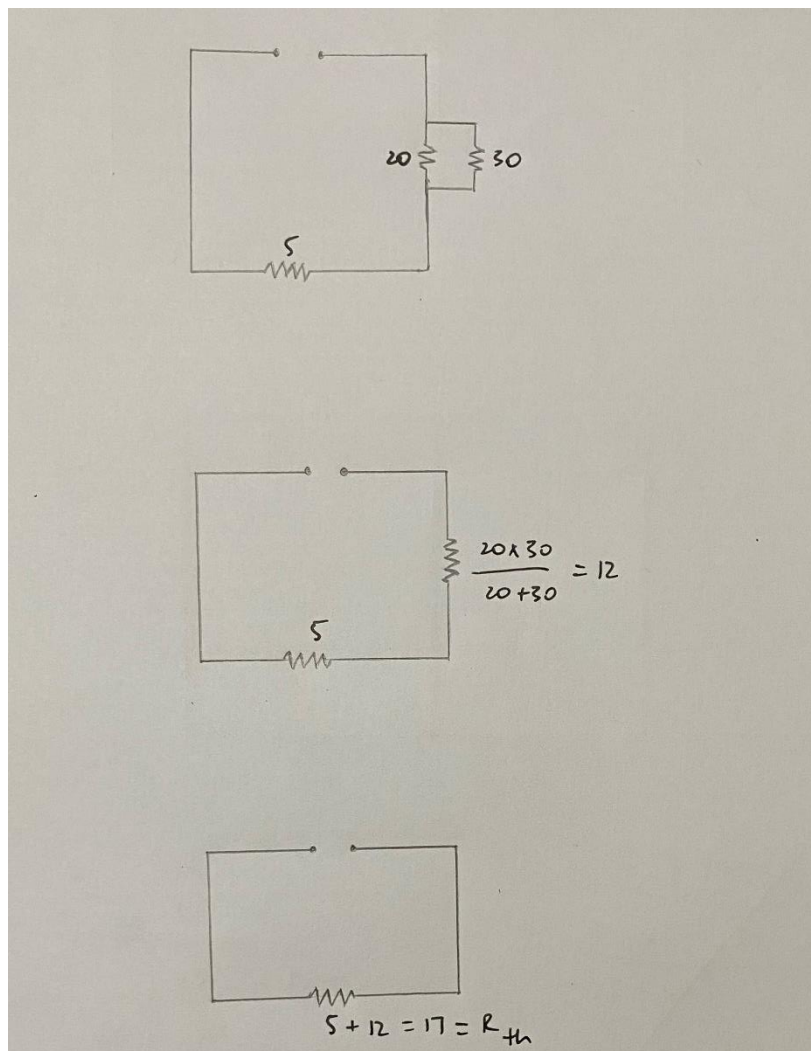
$$V_{th} = V_A - V_B$$

$$= 10 \text{ V}$$

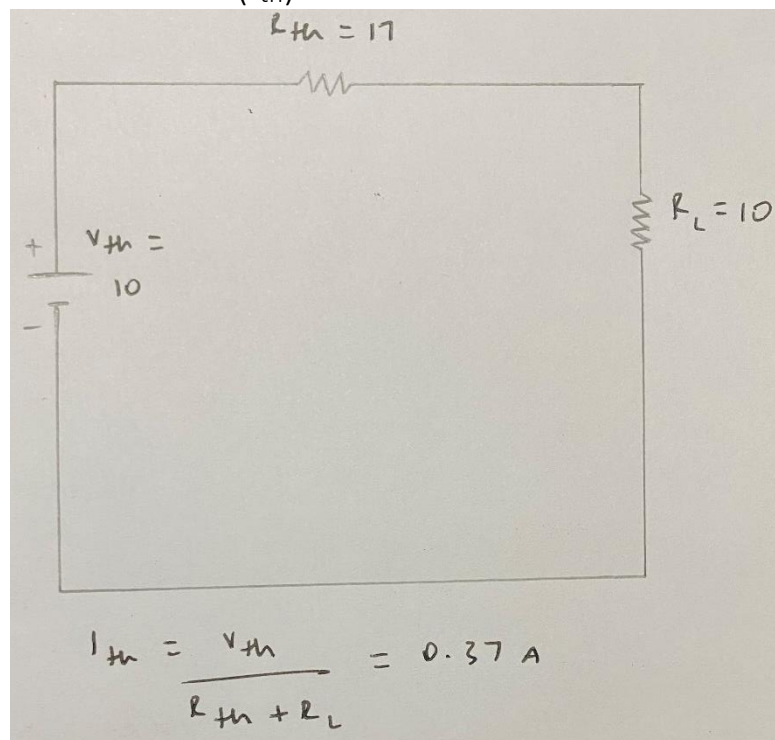
Finding Thevenin Resistance ( $R_{th}$ ):



Can be reduced as:

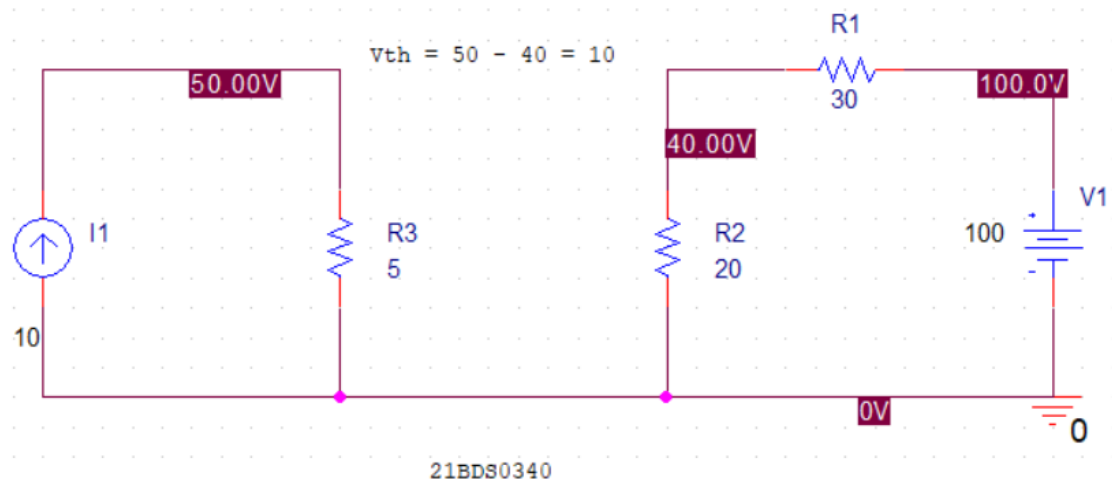


Finding Thevenin Current ( $I_{th}$ ):



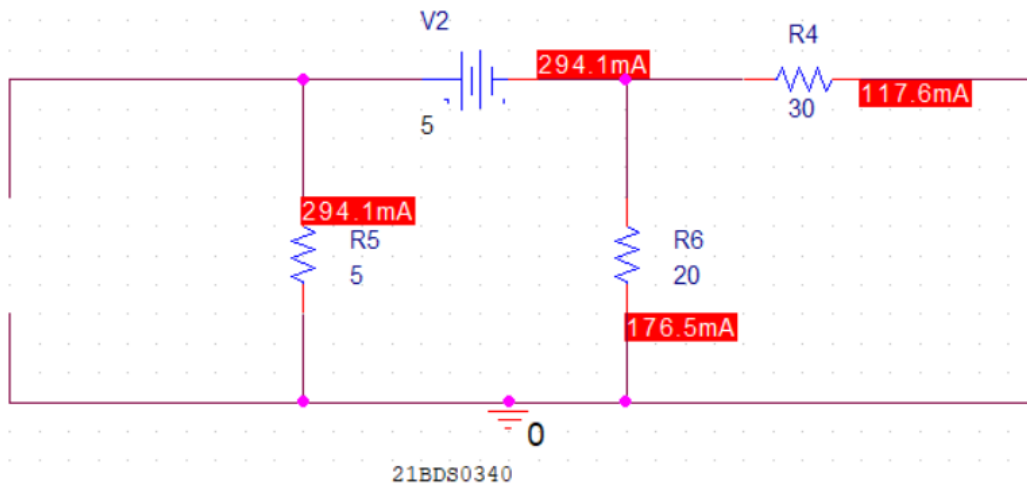
## Simulation Circuits:

### Finding Thevenin Voltage

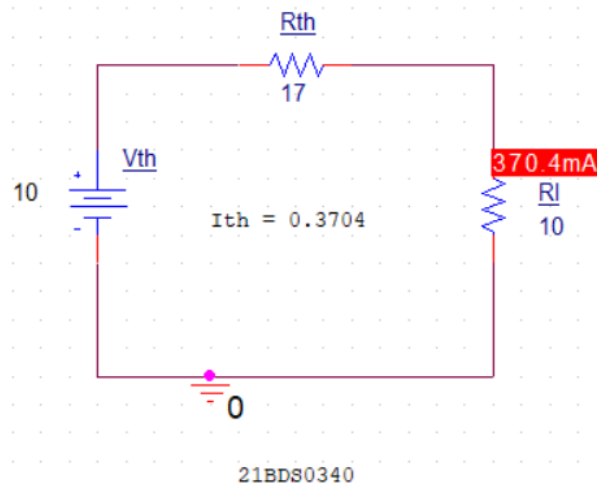


### Finding Thevenin Resistance

$$R_{th} = 5 / 0.2941 = 17.0010$$



### Equivalent Circuit Current



## Procedure:

1. Press 'P' to place a part
2. Press 'R' to filter for a resistor
3. Click analog resistor and place 3 of them referring to the circuit diagram
4. Search for another part 'Vdc' and place 1
5. Search for another part 'Idc' and place 1
6. Place a ground from the right side selection menu.
7. Run the simulation by creating one and clicking 'Run simulation'
8. Create another circuit to find thevenin resistance by following the above steps, simulate it
9. Create another circuit to find the thevenin current by creating the equivalent circuit, simulate it

## Result:

### Thevenin Theorem

NOTATION	MANUAL CALCULATIONS	SIMULATED RESULT
$V_{TH}$	10	10
$R_{TH}$	17	17
$I_{TH}$	0.37	0.37

### Inference:

By finding thevenin current manually and with ORCAD, the values match, showing that an equivalent circuit with just 1 voltage and resistance with the load can be formed.