INDRAPRASTHA INSTITUTE *of*
INFORMATION TECHNOLOGY
DELHI

Department
of
Electronics & Communication Engineering

ECE113|Basic Electronics

Lab :1

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Date:19-06-21

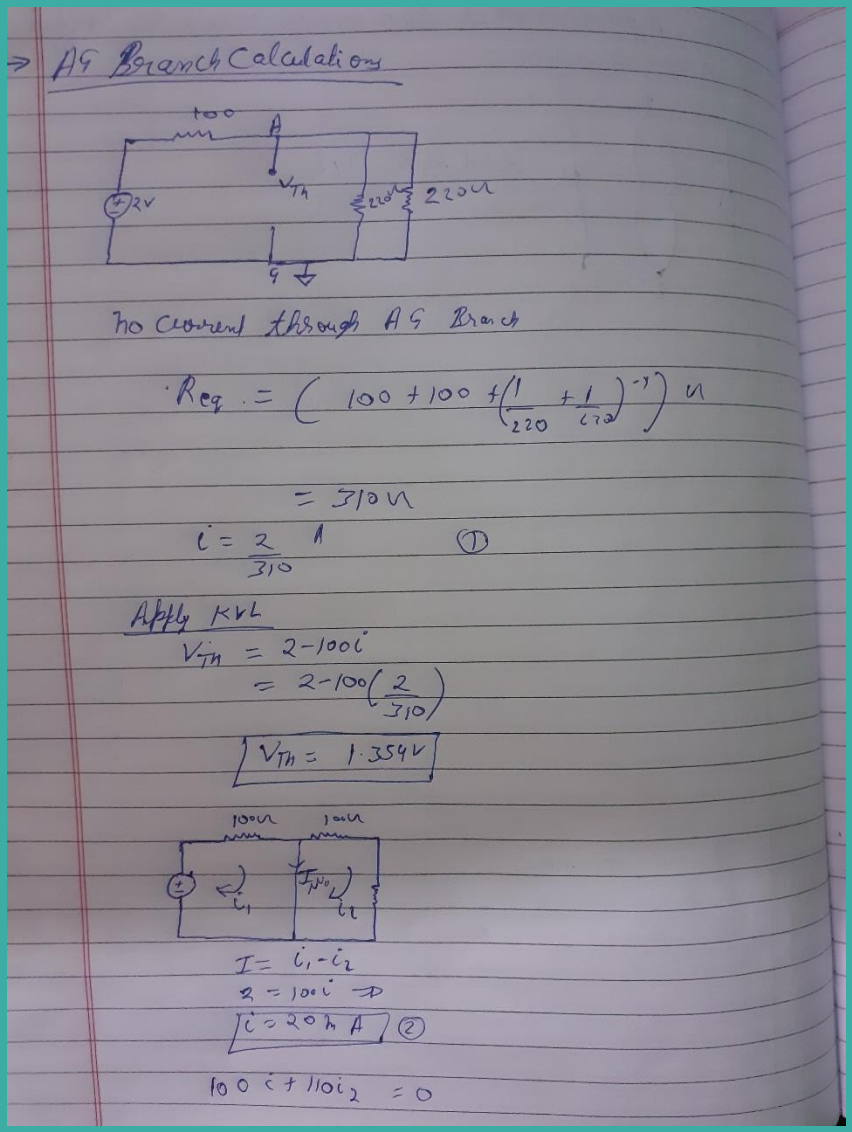
Aim: 1) Verify Thevenin's and Norton's equivalent representations using TinkerCAD.
2)Verify Thevenin's and Norton's equivalent representations using Virtual Labs.

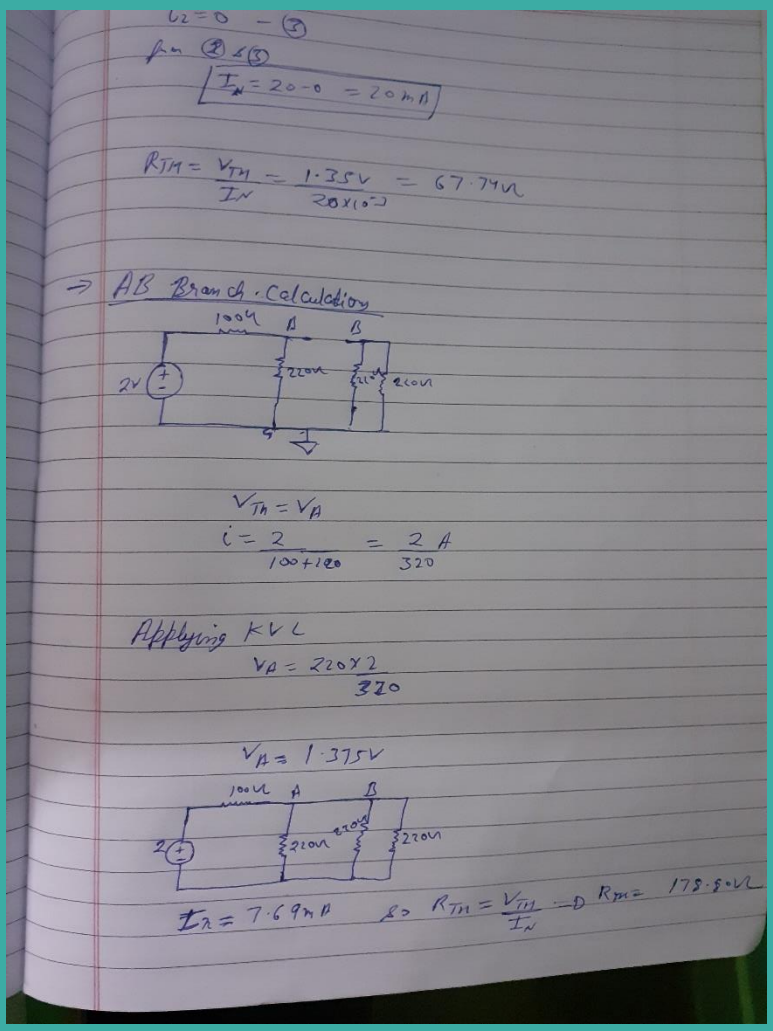
Components: Power supply, Amperage Multimeter, resistor, wires.

Software/Tools Used :

- TinkerCad
- Virtual Labs

Theoretical Calculation :

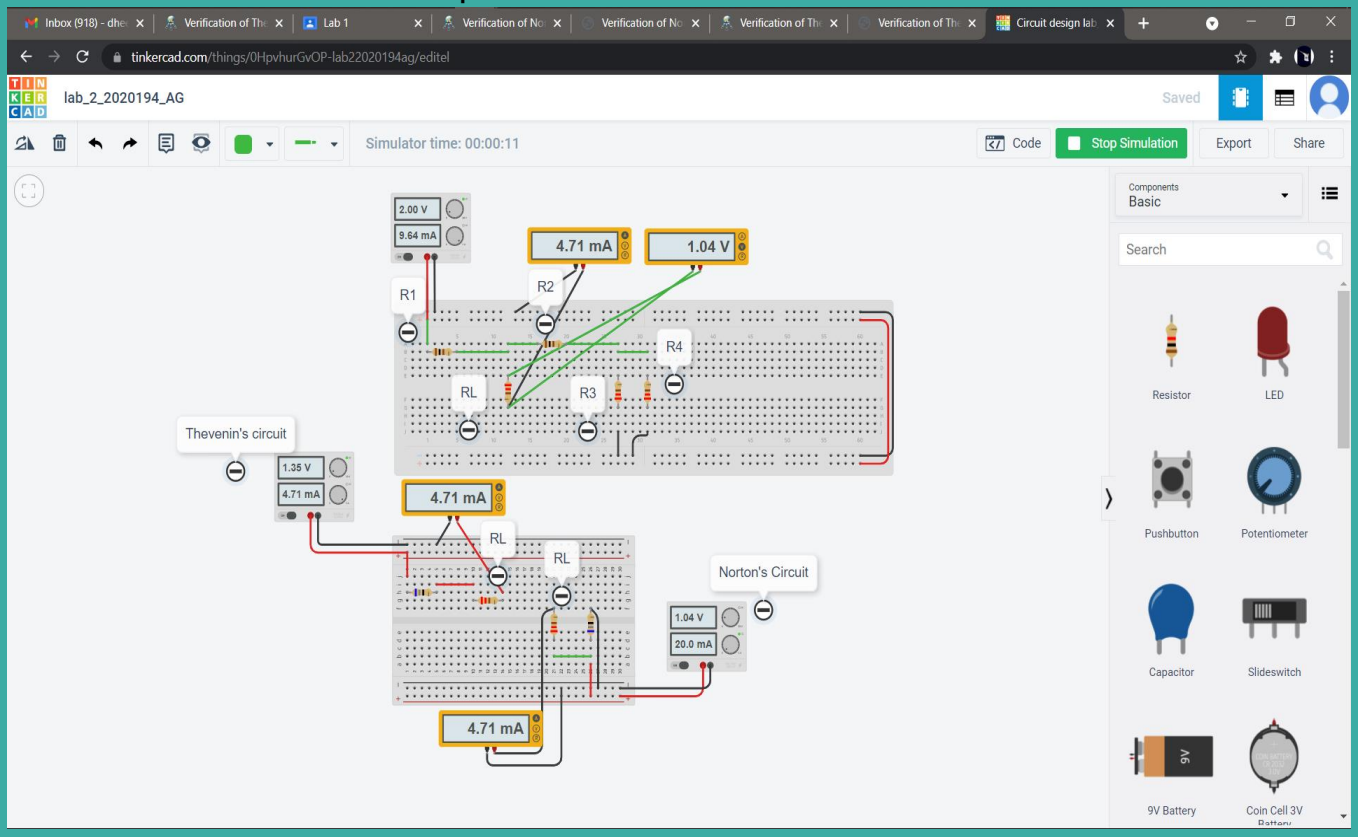




Circuit Diagram and Link:

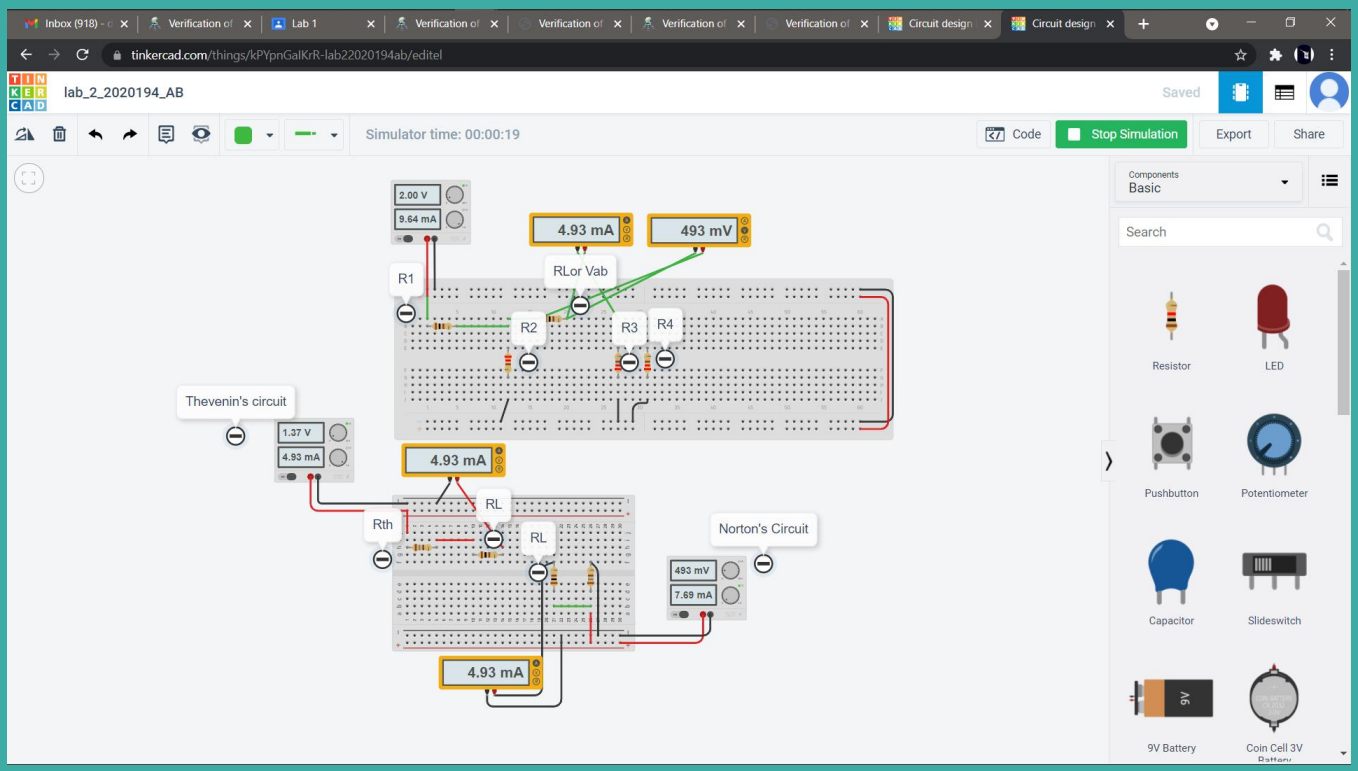
https://www.tinkercad.com/things/0HpvhurGvOP-lab22020194ag/editel?sharecode=5faj6QJv5khcoAZQxOSJN5k5O2-P55FyaoNJwZu9zYQ

Thevenin’s and Norton’s equivalence across the branch AG



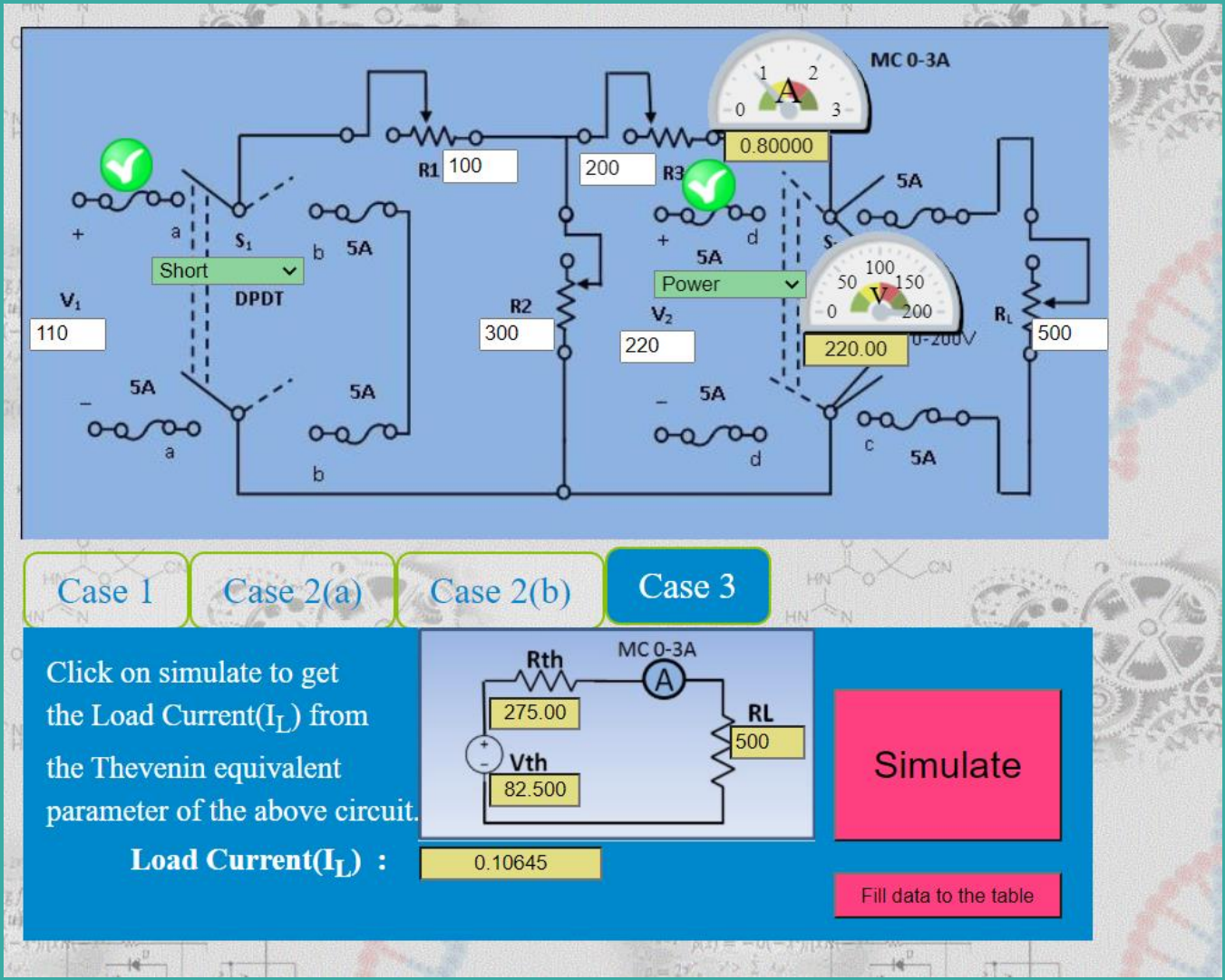
Thevenin’s and Norton’s equivalence across the branch AB.

https://www.tinkercad.com/things/kPYpnGaIKrR-lab22020194ab/editel?sharecode=cak9_Mzb69l6ACb_hjy-UCYel6MK7bVoYK7N-GWucDo

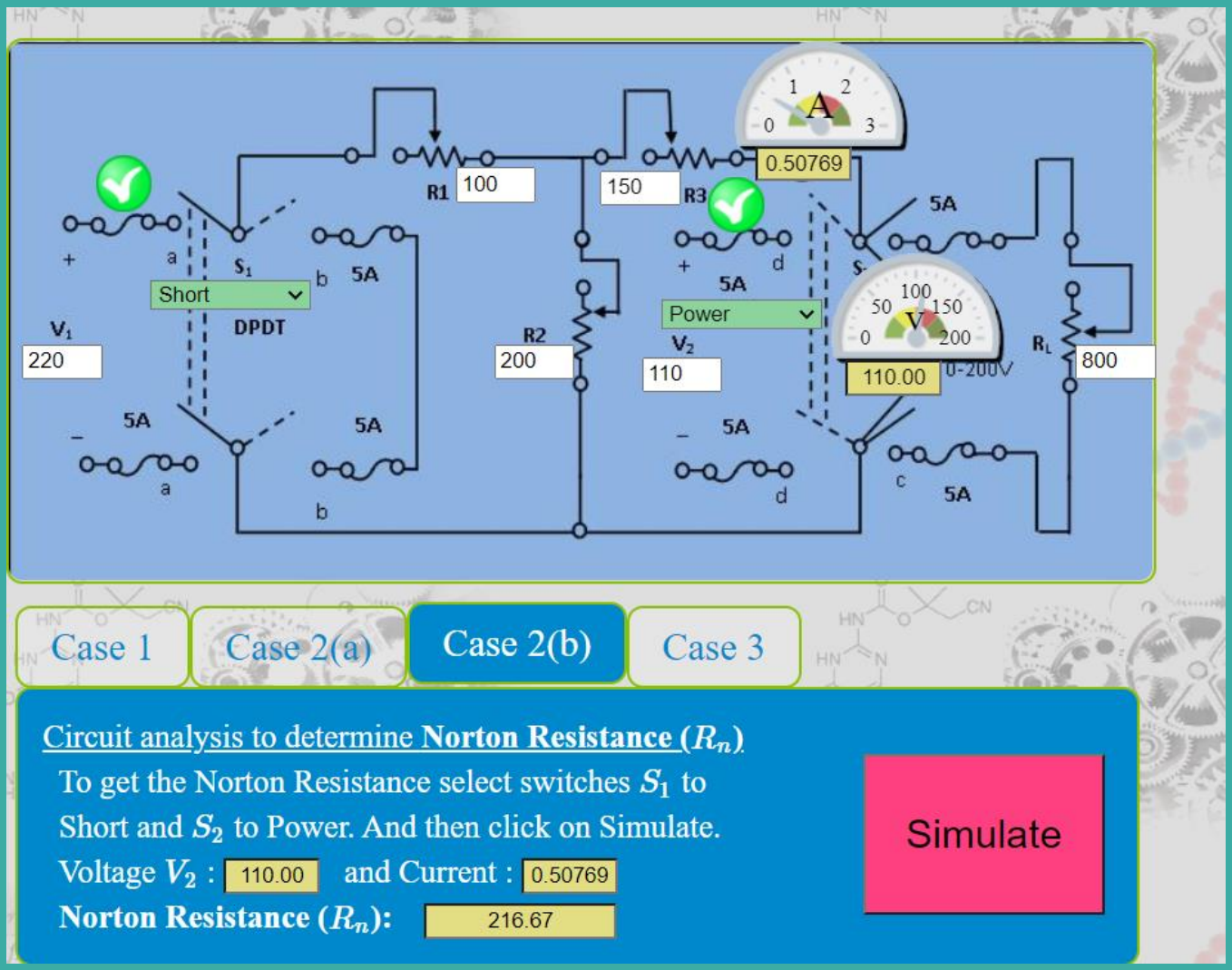


V_LAB:

Verification of Thevenin's Theorem



Verification of Norton's Theorem



OBSERVATION Table:

- Thevenin's and Norton's equivalence across the branch AG.

VTH =1.35V , *RTH* = 67.74(ohm) , *IN* =20mA

S.no	RL(ohm)	IL (from Original Circuit)	IL (from Thevenin's Circuit)	IL (from Norton's Circuit) (mA	VAG(from Original Circuit)	VAG(from Thevenin's Circuit)	VAG(from Norton's Circuit)
1	220	4.71mA	4.71mA	4.71mA	1.04V	1.04V	1.04V

2	210	4.88mA	4.88mA	4.88mA	1.02V	1.02V	1.02V
3	100	8.08mA	8.07mA	8.08mA	808mV	808mV	808mV
4	50	11.5mA	11.5mA	11.5mA	575mV	575mV	575mV
5	400	2.90mA	2.89mA	2.90mA	1.16V	1.16V	1.16V

- Thevenin's and Norton's equivalence across the branch AB.

VTH =1.375V , *RTH* = 178.80(ohm) , *IN* =7.69mA

S.no	RL(ohm)	IL (from Original Circuit)	IL (from Thevenin's Circuit)	IL (from Norton's Circuit)	VAG(from Original Circuit)	VAG(from Thevenin's Circuit)	VAG(from Norton's Circuit)
1	100	4.93mA	4.93mA	4.93mA	439mV	439mV	439mV
2	210	3.54mA	3.54mA	3.54mA	743mV	743mV	743mV
3	20	6.92mA	6.92mA	6.92mA	138mV	138mV	138mV
4	50	6.01mA	6.01mA	6.01mA	301mV	301mV	301mV
5	400	2.38mA	2.38mA	2.38mA	950mV	950mV	950mV

V_LAB OBSERVATION TABLE:

Thevenin's

Observation Table:

Serial no. of Observation	Load Current(I_L) from case 1	Load Voltage(V_L)	Load Resistance (R_L)=V_L/I_L	Thevenin Voltage(V_{th}) from case 2(a)	2nd Voltage source(v) for case 2(b)	Ammeter Reading(I) from case 2(b)	Thevenin Resistance R_{th}=V/I	Load current (I_L)=$V_{th}/(R_{th}+R_L)$
1st	0.10645	53.225	500	82.500	220	0.80000	275.00	0.10645
2nd	0.12222	48.888	400	82.500	220	0.80000	275.00	0.12222
3rd	0.12222	48.888	400	82.500	220	0.80000	275.00	0.12222
4th	0.22000	22	100	82.500	220	0.80000	275.00	0.22000
5th	0.20886	25.0632	120	82.500	220	0.80000	275.00	0.20886

Norton's

Observation Table:

Serial no. of Observation	Load Current(I_L) from case 1	Load Voltage(V_L)	Load Resistance (R_L)=V_L/I_L	Norton current(I_{sc}) from case 2(a)	2nd Voltage source(v) from case 2(b)	Ammeter Reading(I) from case 2(b)	Norton Resistance R_n=V/I	Load current (I_L)=I_{sc}*R_n/(R_n+R_L)
1st	0.14426	115.41	800	0.67692	110	0.50769	216.67	0.14426
2nd	0.16923	110.00	650	0.67692	110	0.50769	216.67	0.16923
3rd	0.15141	113.86	752	0.67692	110	0.50769	216.67	0.15141
4th	0.24581	93.408	380	0.67692	110	0.50769	216.67	0.24581
5th	0.12465	119.66	960	0.67692	110	0.50769	216.67	0.12465

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Observations/Results: Hence Thevenin's and Norton's **Theorem** verified using TinkerCAD and Virtual Labs

Applications:

- reduce a complex circuit into a simple circuit
- Norton's theorem is useful to solve problems on parallel generators with unequal emf's and unequal impedances.
- Thevenin theorem provides an efficient way to calculate the voltage and current flowing across a load without having to recalculate the entire circuit