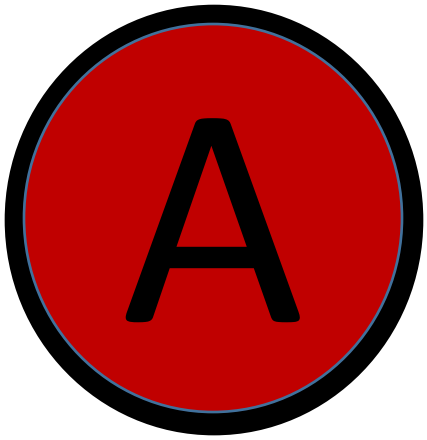
EXPERIMENT NO 3

VERIFICATION OF NORTON'S THEOREM



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AIM :- *TO VERIFY THE **NORTON'S THEOREM***

THEORY :-

NORTON THEOREM STATES THAT IT IS POSSIBLE TO SIMPLIFY ANY ***LINEAR CIRCUIT** NO MATTER HOW TOUGH OR COMPLEX IT IS TO AN **EQUIVALENT CIRCUIT** THAT IS FAR EASIER TO SOLVE , WITH JUST SINGLE ***CURRENT SOURCE** AND PARALLEL RESISTANCE CONNECTED TO A LOAD LIKE THEVENINS THEOREM WHERE WE PLACE A VOLTAGE SOURCE ALONG WITH A RESISTANCE CONNECTED IN SERIES

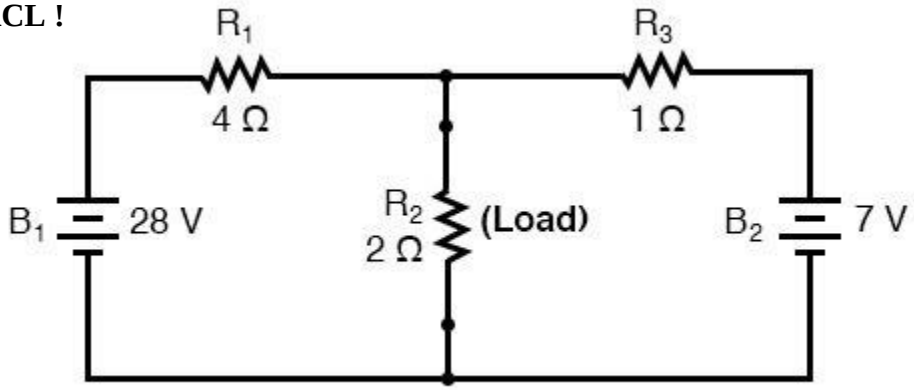
NORTON'S THEOREM IS A WAY TO **REDUCE** A NETWORK TO AN **EQUIVALENT** CIRCUIT COMPOSED OF A **SINGLE CURRENT SOURCE, PARALLEL RESISTANCE**, AND **PARALLEL LOAD (RESISTANCE)**.

***LINEAR CIRCUIT HERE SIGNIFIES SAME MEANING WHICH IT IMPLIES IN THE SUPERPOSITION THEOREM ALL UNDERLYING MUST BE LINEAR (NO EXPONENTS OR ROOT POWER)**

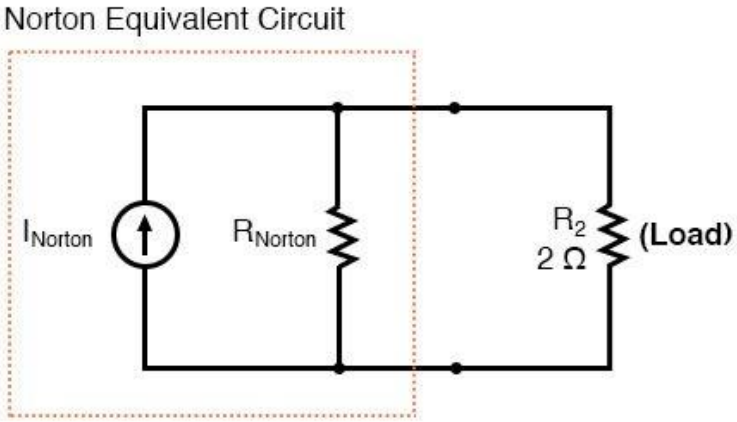
***A CURRENT SOURCE IS A COMPONENT WHOSE JOB IS TO PROVIDE A CONSTANT AMOUNT OF CURRENT, OUTPUTTING AS MUCH OR AS LITTLE VOLTAGE NECESSARY TO MAINTAIN THAT CONSTANT CURRENT**

FOR EXAMPLE :

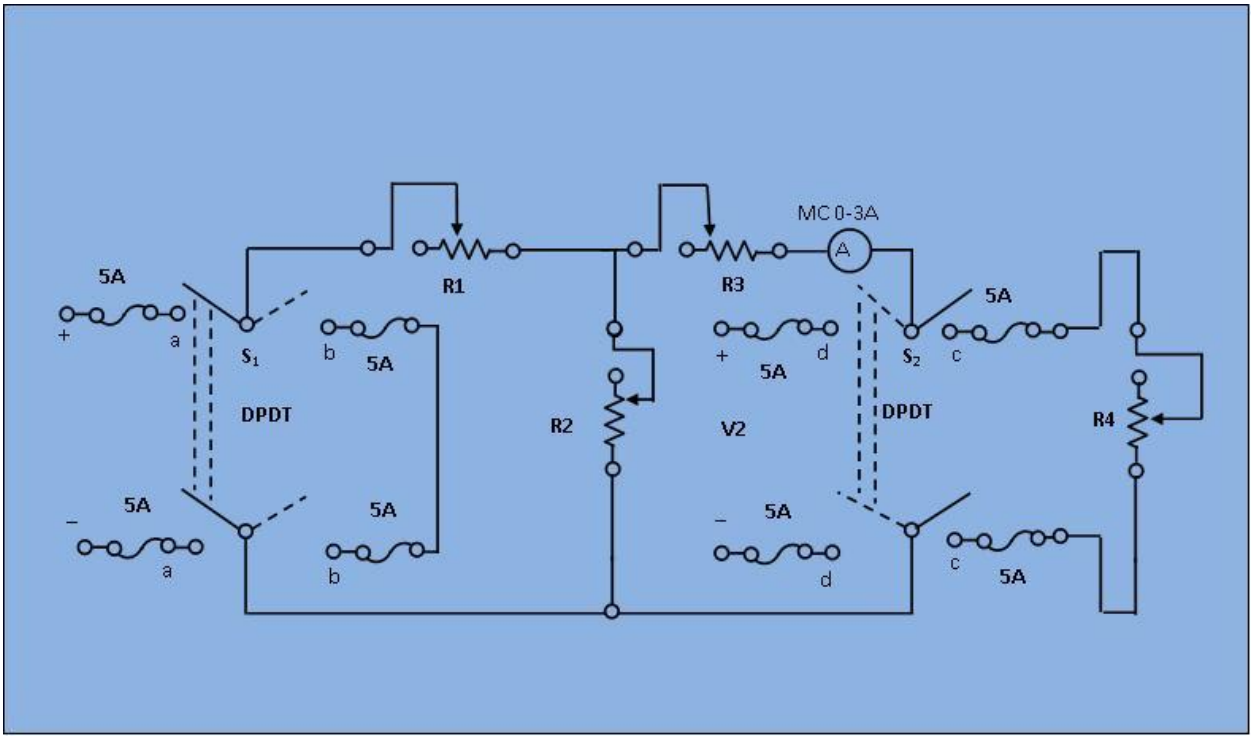
THIS IS A CIRCUIT THAT IS QUITE LENGTHY TO SOLVE USING MESH ANALYSIS , KCL !



NOW AFTER APPLYING **NORTON THEOREM** TO THE SAME CIRCUIT , THIS IS HOW IT LOOKS LIKE :-



Procedure:



Keep all the resistances **(R_1, R_2, R_3 & R_L)** close to their respective **maximum** values.

Choose any arbitrary values of V_1 and V_2.

Experiment Part :

Case 1:

Select switch of **S_1** to **Power** and **S_2** to **Load** and **Simulate** the program from **Case 1** tab.

Case 2:

a)Norton Short circuit current analysis:

Apply **switch S_1** to **power** and **S_2** to **Short** and **Simulate** the program and read Norton short circuit current (**I_{sc}**) from Case 2(a) tab.

b)Norton Resistance analysis:

Apply switch S_1 to short and S_2 to **power** and **Simulate** the program and read Norton resistance (R_n) from Case 2(b) tab.

Case 3: Using Isc and Rn determine Load Current

Simulate the program and read Load current (I_L) from Case 3 tab. Compare the load currents (I_L) obtained from **Case 1** tab.

MC-Moving Coil.

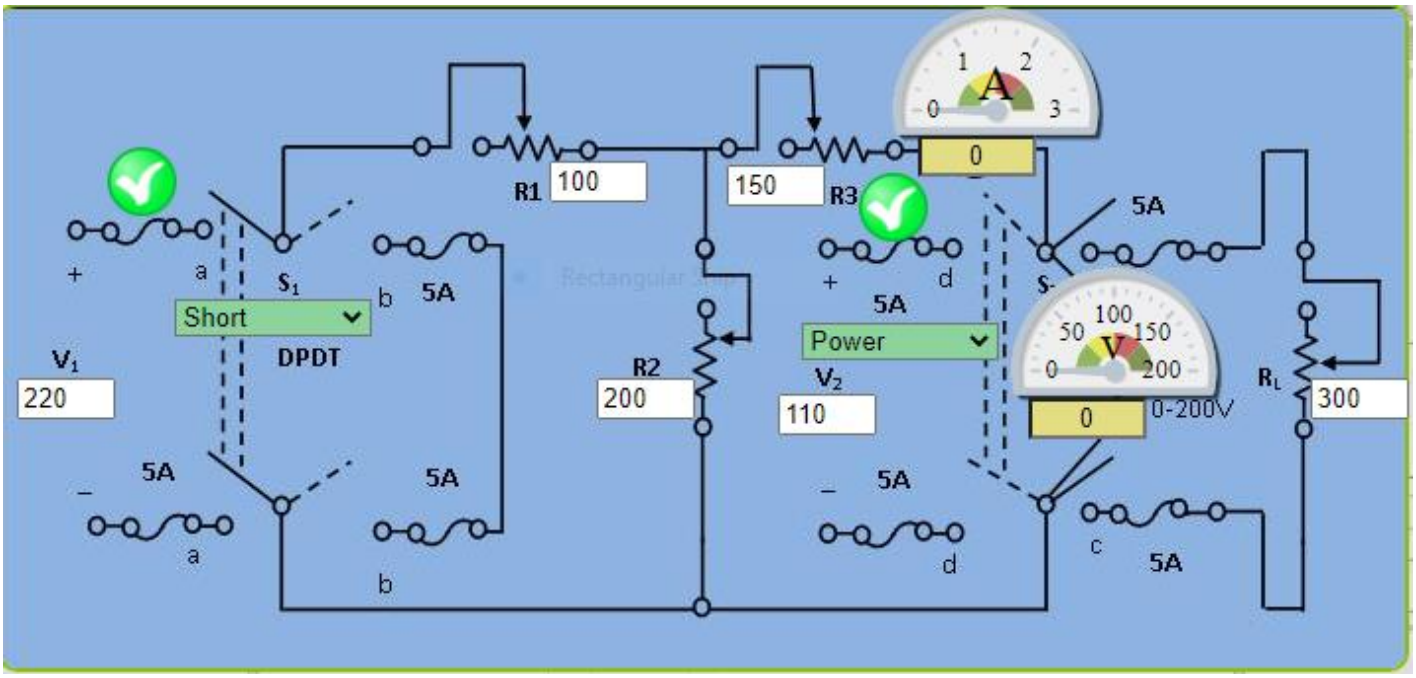
DPDT- Double pole Double throw.

N.B.:- All the resistances are in ohms.

OBSERVATIONS:-

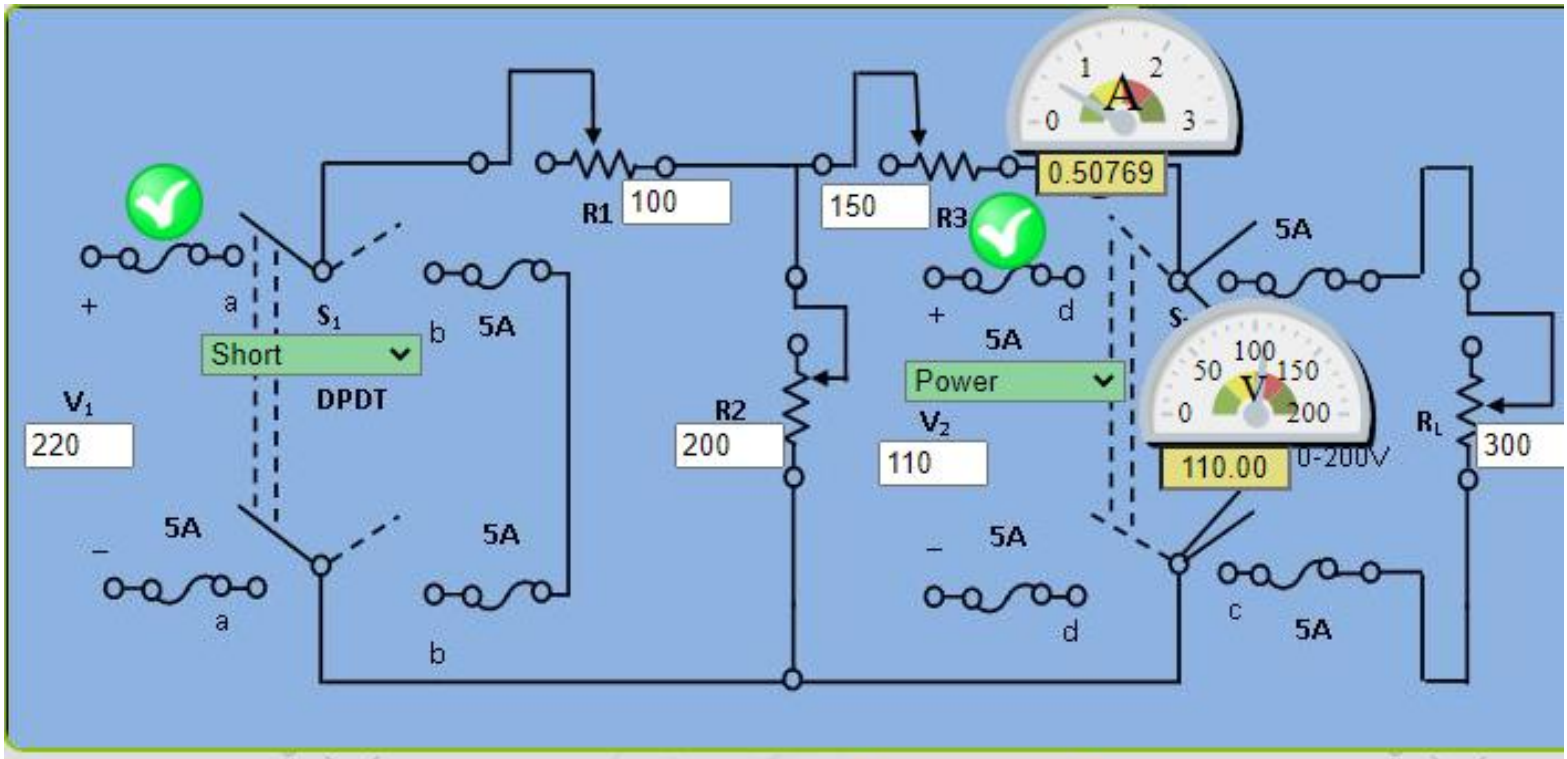
THE FOLLOWING READINGS ARE TAKEN FROM VLABS :-

PICTURE ATTACHED OF THE WORKING VLAB

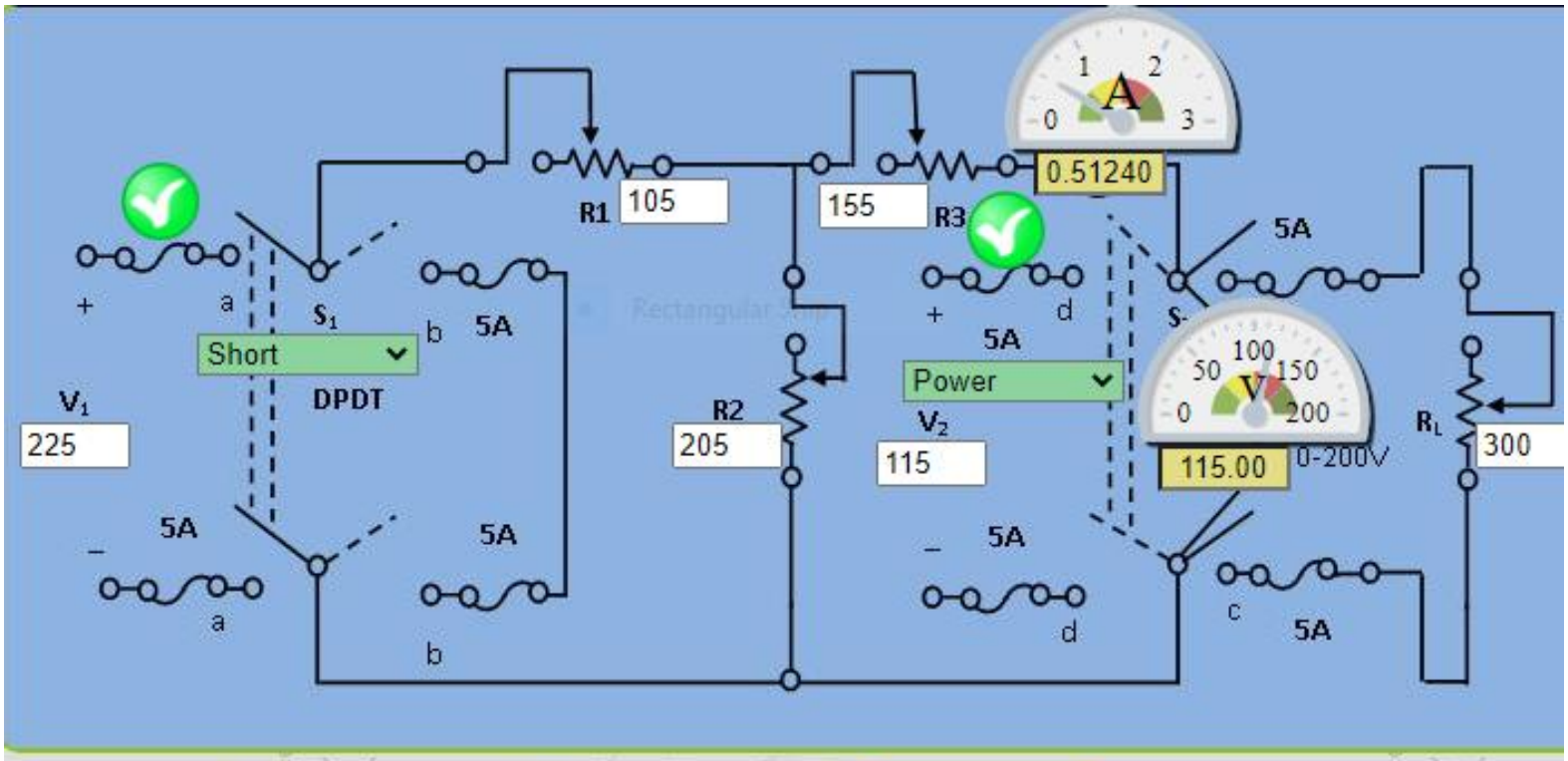


EACH READING IS TAKEN AFTER INCREMENTING VOLTAGE SOURCES BY 5V AND AFTER CHANING THE VALUES OF RESISTANCES

READING 1

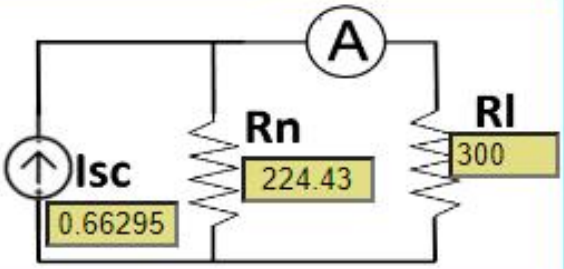


READING 2



Case 1 | Case 2(a) | Case 2(b) | Case 3

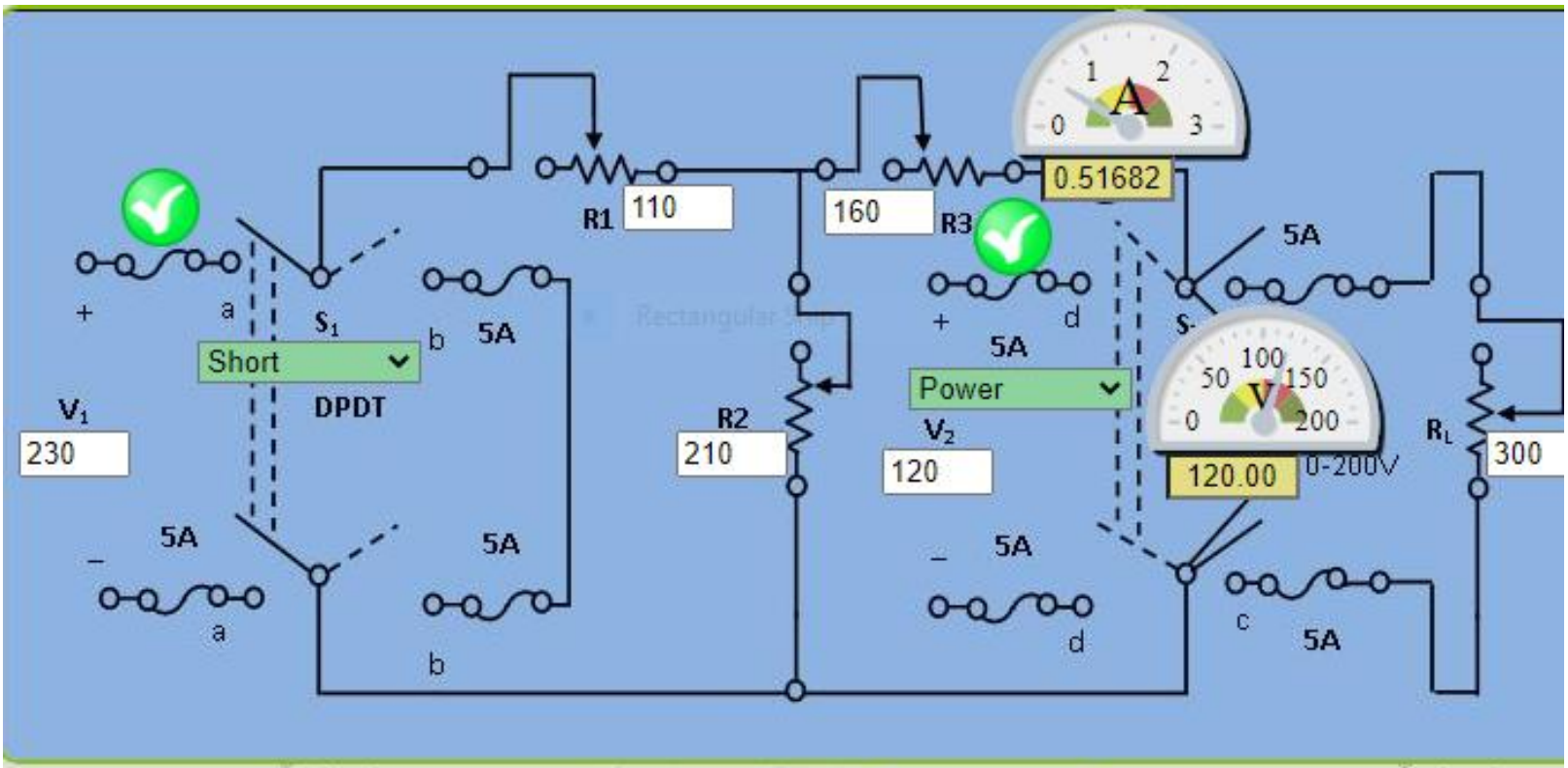
Click on simulate to get the Load Current(I_L) from the Thevenin equivalent parameter of the above ckt.



Simulate

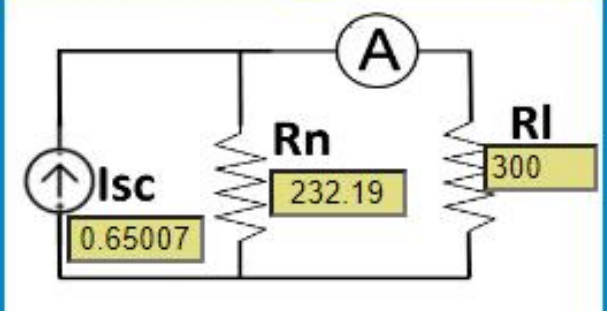
Load Current(I_L) : 0.28371

READING 3



Case 1 | Case 2(a) | Case 2(b) | Case 3

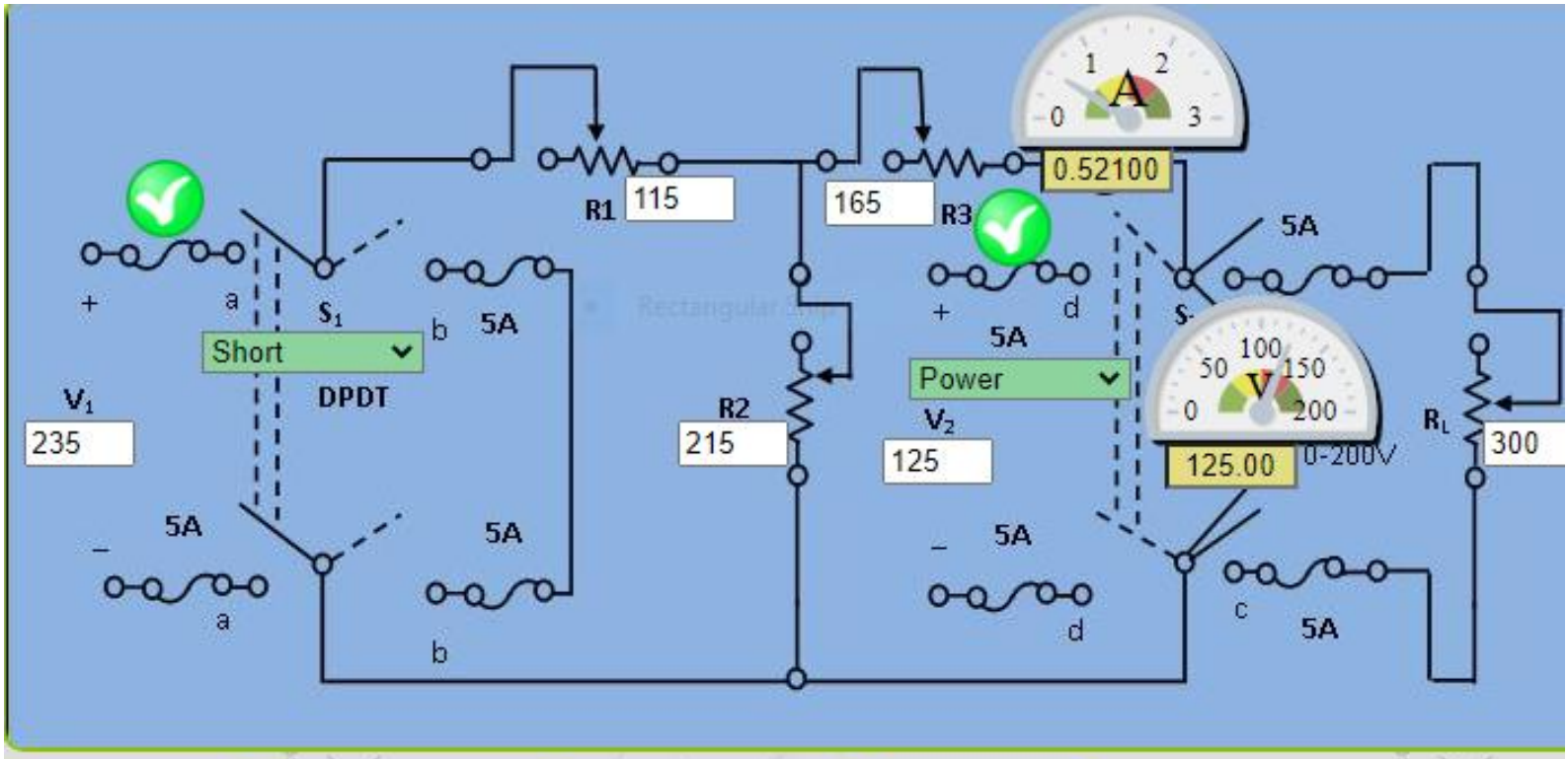
Click on simulate to get the Load Current(I_L) from the Thevenin equivalent parameter of the above ckt.



Simulate

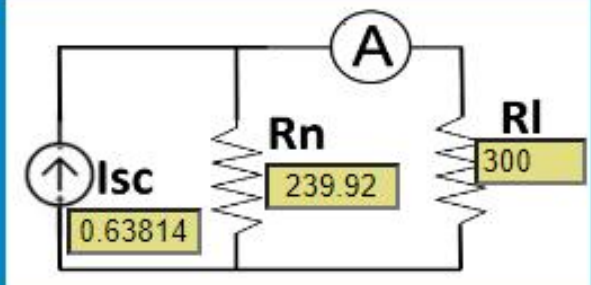
Load Current(I_L) : 0.28362

READING 4



Case 1 | Case 2(a) | Case 2(b) | Case 3

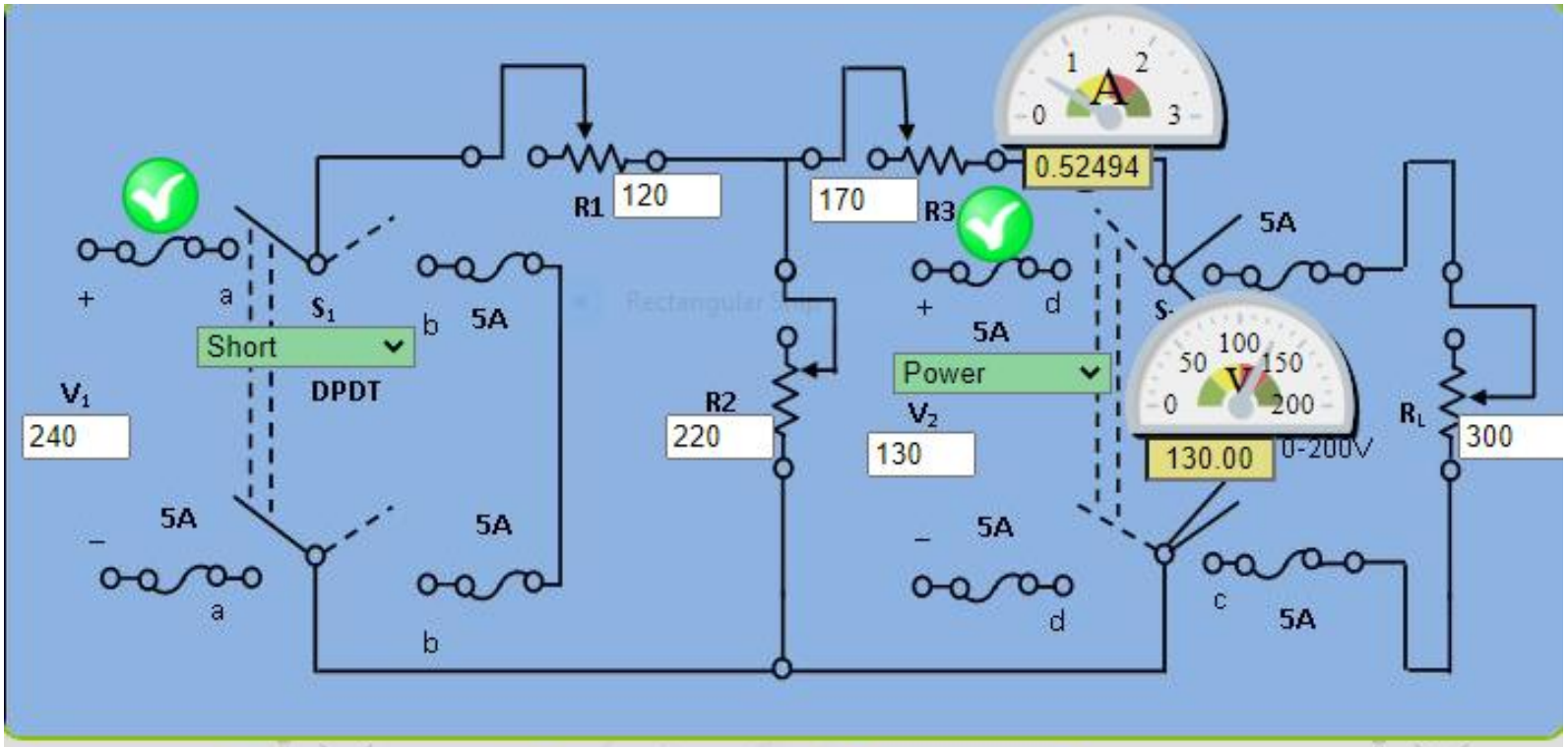
Click on simulate to get the Load Current(I_L) from the Thevenin equivalent parameter of the above ckt.



Simulate

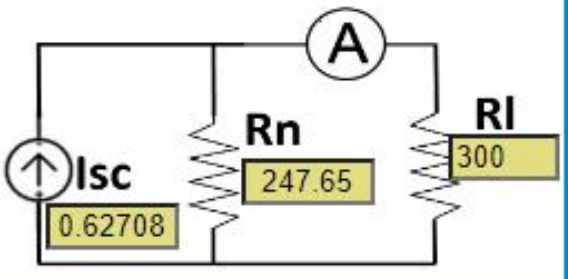
Load Current(I_L) : 0.28357

READING 5



Case 1 | Case 2(a) | Case 2(b) | Case 3

Click on simulate to get the Load Current(I_L) from the Thevenin equivalent parameter of the above ckt.



Simulate

Load Current(I_L) : 0.28357

OBSERVATION TABLE

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	0.28387	85.161	300	0.67692	110	0.50769	216.67	0.28387
2nd	0.28372	85.116	300	0.66295	115	0.51240	224.43	0.28371
3rd	0.28362	85.086	300	0.65007	120	0.51682	232.19	0.28362
4th	0.28357	85.071	300	0.63814	125	0.52100	239.92	0.28357
5th	0.28357	85.071	300	0.62708	130	0.52494	247.65	0.28357

I_L FROM **CASE 1** == I_L **LOAD** CURRENT

(LAST CASE)

CONCLUSION/RESULT: THE I_1 FROM **FIRST CASE** COMES OUT TO BE **EQUAL** TO I_2 FROM **LAST CASE** .

HENCE,THE **NORTON'S THEOREM** HAS BEEN **VERIFIED**