

Lab 5

EE 222 Section 010

Intro To Electrical Engineering Laboratory
Fall 2022

Lab 5: Thevenin's Equivalent Circuit and Maximum Power Transfer

Name: Azain Uqaily

10/17/22

Procedure

This lab helped me test out the idea of a load Resistance and a thevenin equivalent circuit. It is very practical to be able to take a messy circuit and reduce it down to a simple circuit (Thevenin Circuit) which is composed of a single voltage source and one resistor.

STEP 1

Calculation

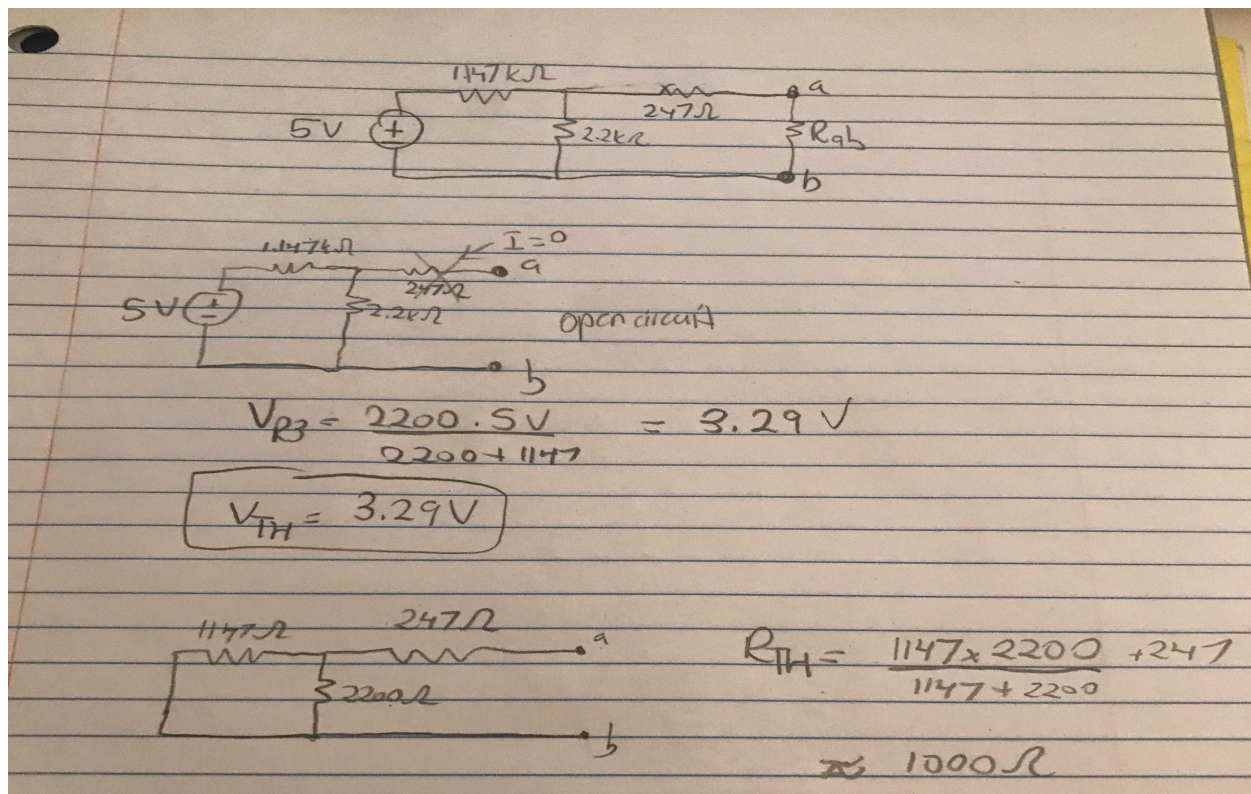


Figure 1.A Calculations for V_{th} and R_{th}

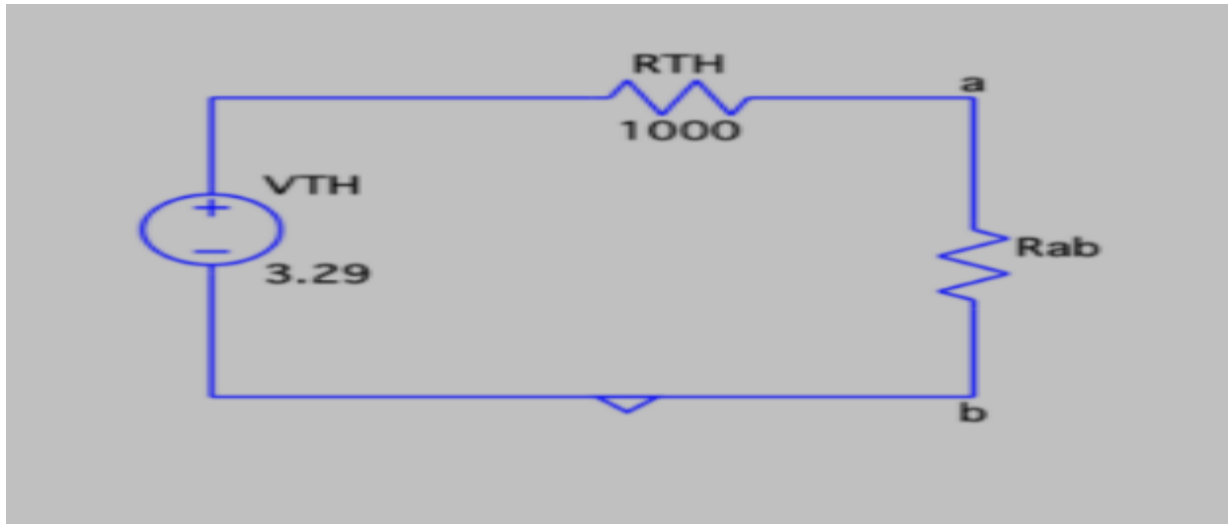


Figure 1.B: Thevenin Equivalent Circuit

Step II

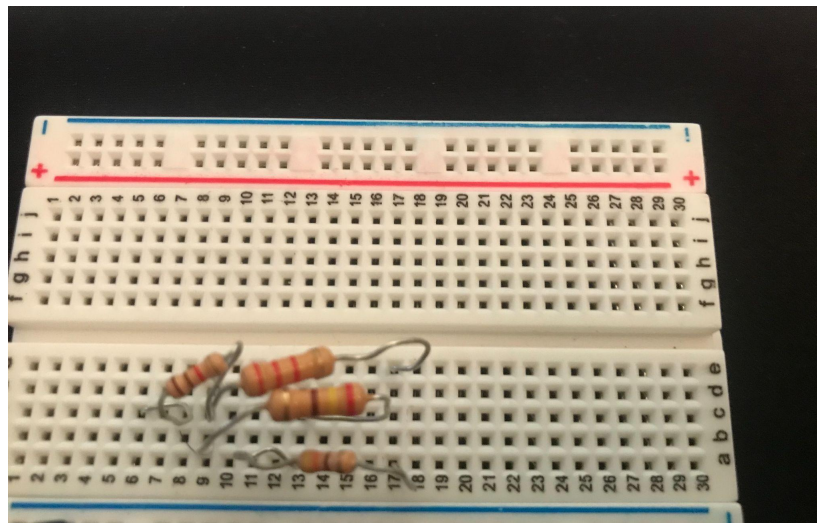


Figure 2.A: Figure 1 circuit

Step III

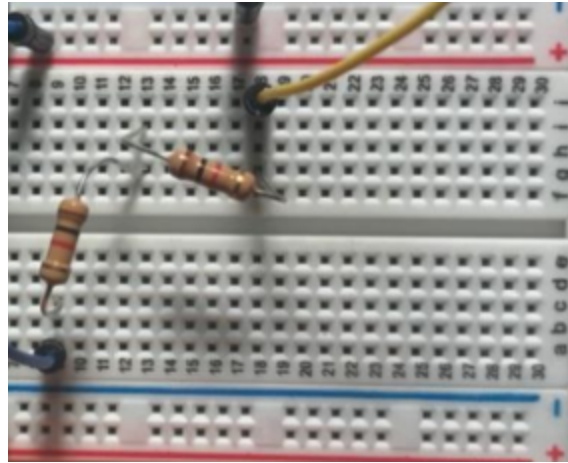


Figure 3.A thevenin equivalent circuit

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Circuit: *  
  
Direct Newton iteration for .op point succeeded.  
Operating Bias Point Solution:  
V(n001)          3.29   voltage  
V(a)             1.645   voltage  
I(Rab)           0.001645 device_current  
I(Rth)           -0.001645 device_current  
I(Vth)           -0.001645 device_current  
  
Date: Tue Oct 20 14:12:01 2020  
Total elapsed time: 0.019 seconds.
```

Figure 3.B Thevenin circuit simulation Voltage

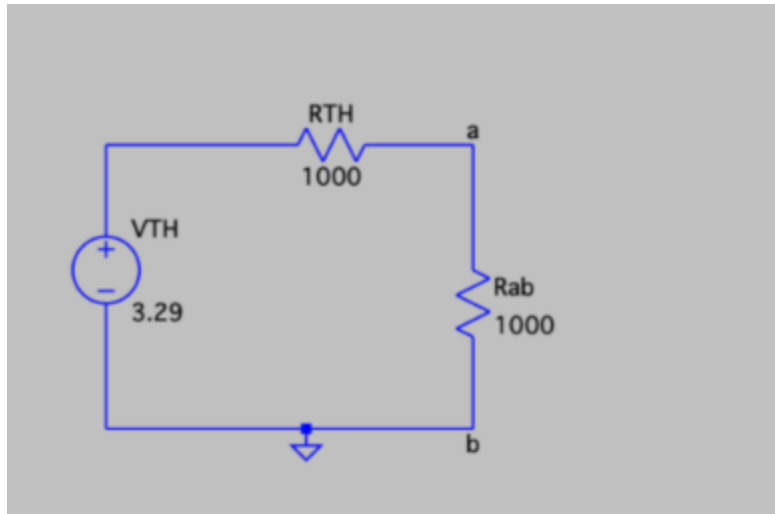


Figure 3.C max power

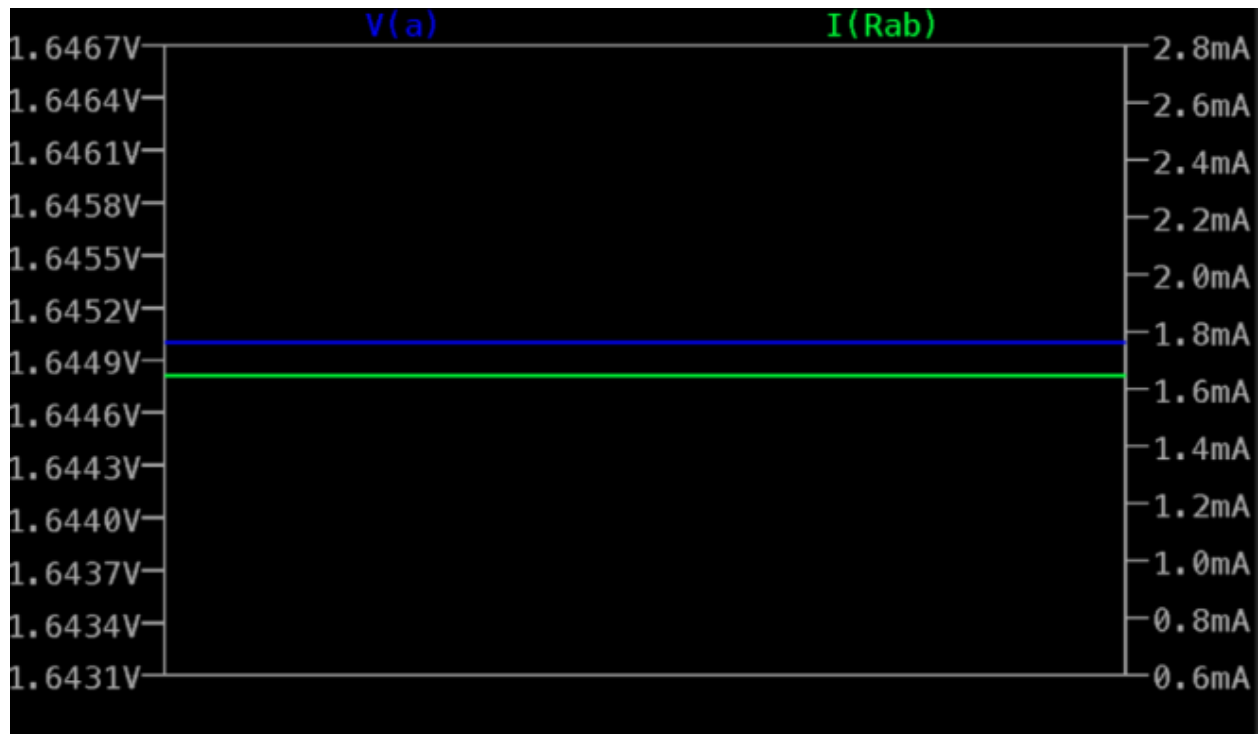


Figure 3.D Voltage and Amps

Results

Resistors used in given Circuit

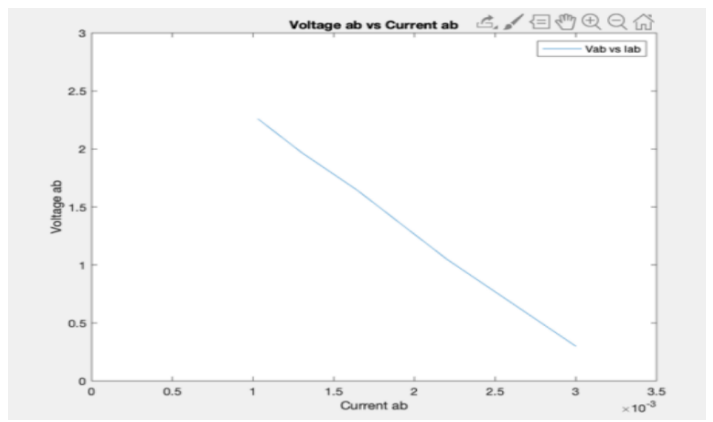
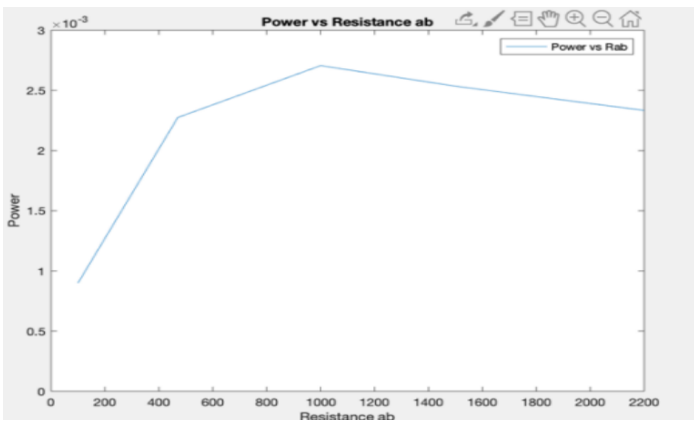
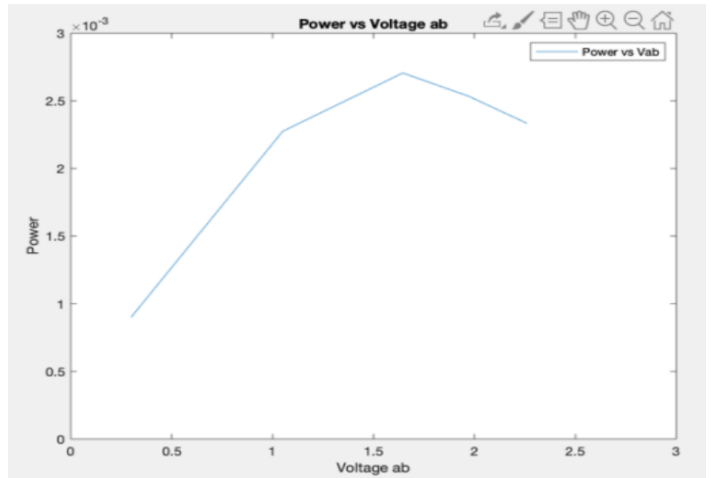
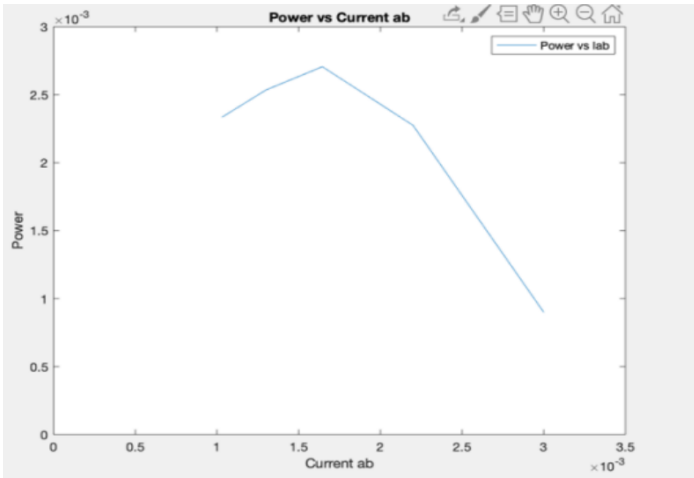
Resistors	Theoretical Value	Measured Value	%Error
1100	1147	1131	1.39
2200	2200	2150	2.27
240	247	243	1.62

Thevenin's Voltage and Resistance

	Theoretical	Measured
Thevenin Voltage	3.3	SKIP
Thevenin Resistance	<u>1000</u>	<u>SKIP</u>

Load Voltage and Current

Rab	Measured Value of Rab	Theoretical Value		Measured Thevenin Value		Measured Original circuit Value	
		Vab (V)	Iab (mA)	Vab (V)	Iab (mA)	Vab (V)	Iab (mA)
100	98.8	0.299	3.0mA	0.3	3	0.31	3.3mA
430	425	1.05	2.2mA	1.04	2.2	0.78	4.5mA
1k	986	1.645	1.645mA	1.64	1.6	1.65	1.6
1.5k	1472	1.97	1.3mA	1.96	1.3	1.98	1.3
2.2k	2140	2.26	1.03mA	2.24	1.0	2.27	1.0



These trends make sense.

Max Power at 1000 ohms

Power is Max when voltage is 1.645 V

Power is Max when current is 1.6 mA

Last graph shows the inverse relationship between voltage and current(Ohm's Law checks out)