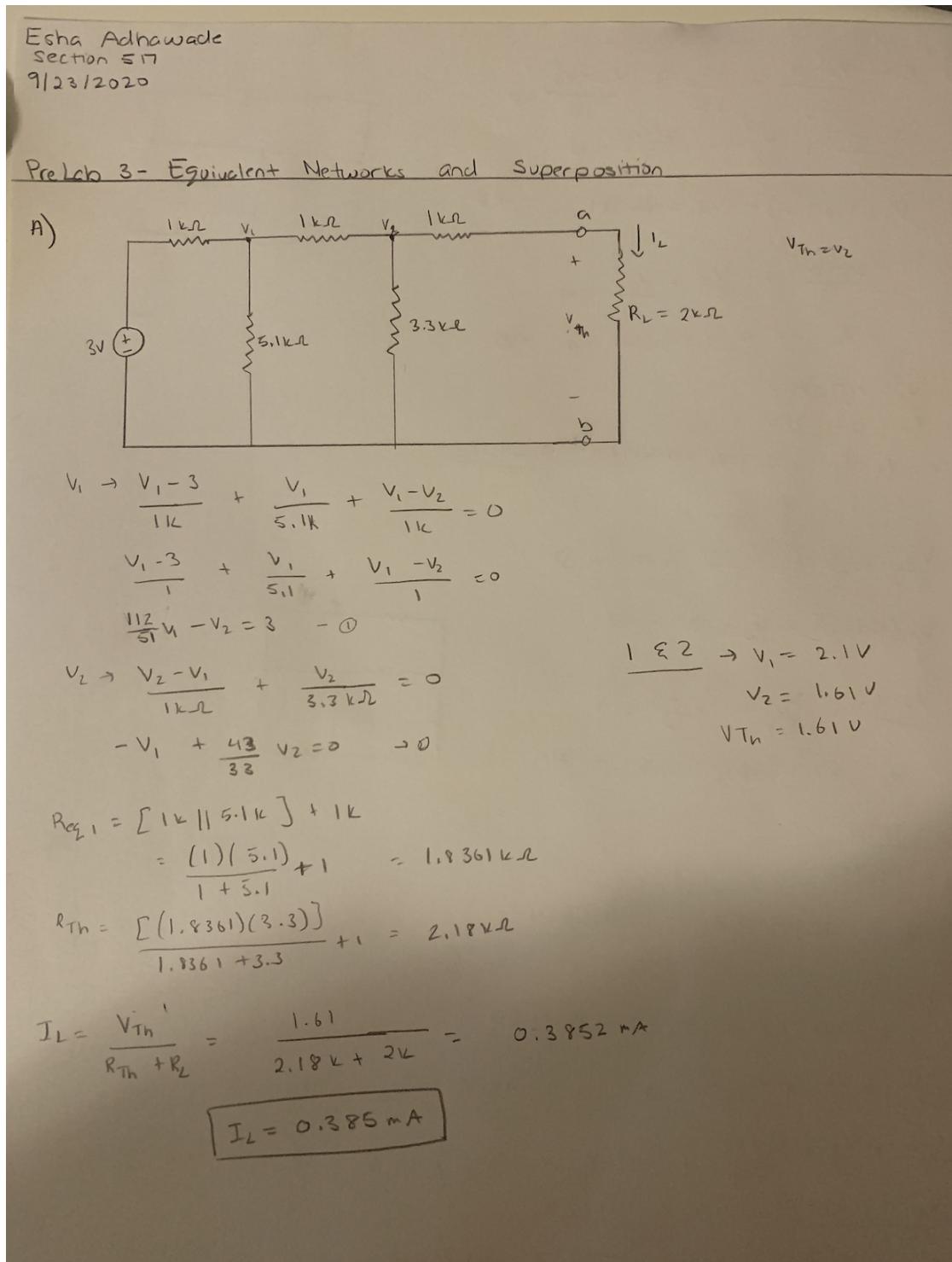


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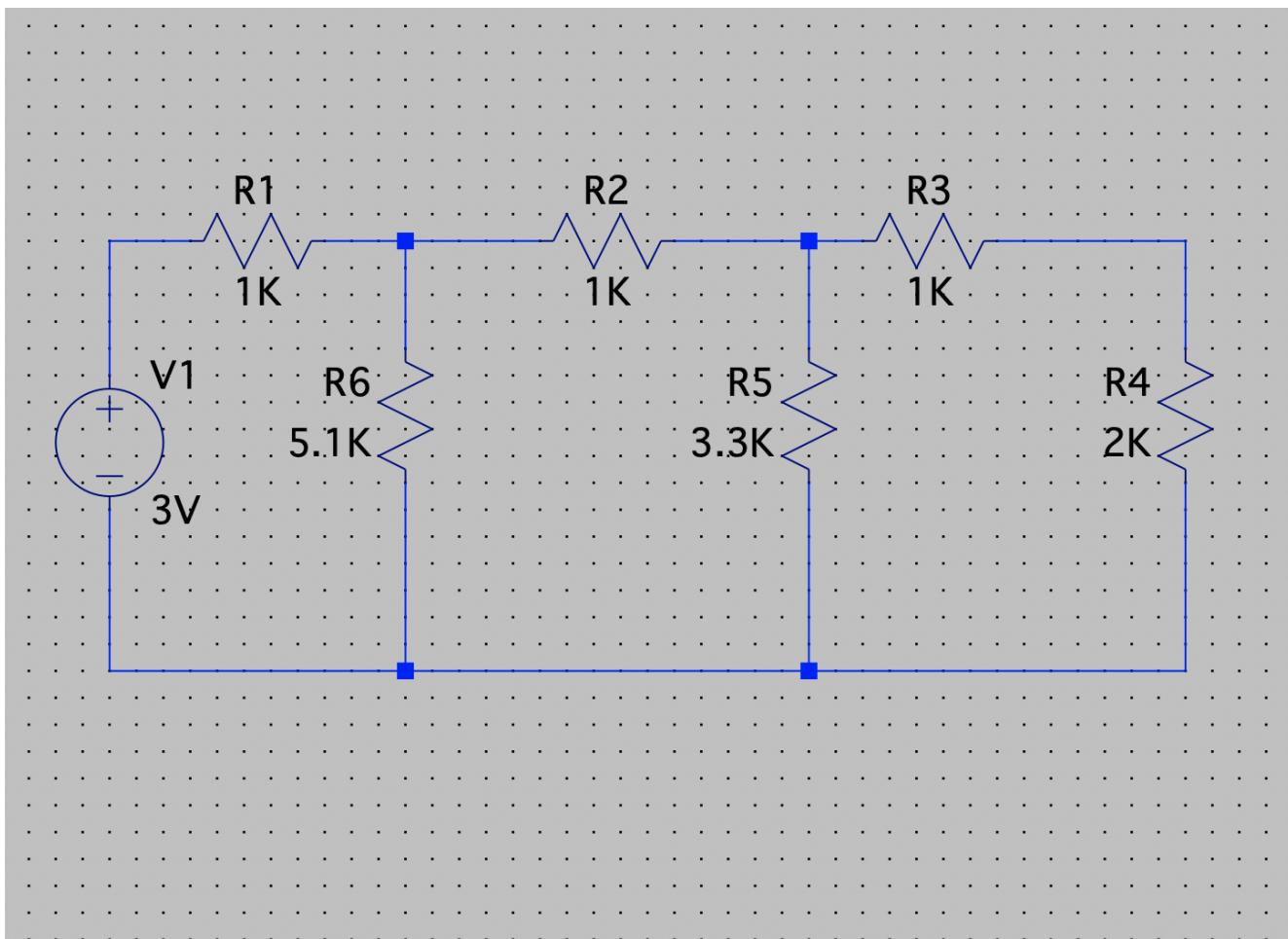
- A. Refer to the circuit in Figure 3.4. Solve for the current through the $2k$ resistor using Thévenin's method. Show all of your steps when you submit your calculations for grading. Note: After finding R_{TH} and V_{TH} , you will need to keep going to find I_L .



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- B. Simulate the circuit in Figure 3.4 in SPICE. Print a screenshot of your circuit schematic with all voltages and currents shown (DC operating point simulation) to hand into your TA. Be sure to save your file.



- C. Write a Netlist for the circuit shown in Figure 3.4. (It is very unlikely your choice of nodes will correspond with SPICE's choice of nodes. Please write your Netlist first.) Now, examine the Netlist created by SPICE. What are the differences between the two? Do they describe the same circuit? Print out your Netlist from SPICE and write out the differences and similarities you have noted to turn in to your TA.

V1	N001	0V	
R1	N002	N001	1000
R2	N003	N002	1000
R3	N004	N003	1000
R4	N005	N001	5100

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R5	N006	N002	3300
R6	N007	N003	2000

```
*  
R1 N002 N001 1K  
R2 N003 N002 1K  
R3 N004 N003 1K  
R4 N005 N004 2K  
R5 N005 N003 3.3K  
R6 N005 N002 5.1K  
V1 N001 N005 3V  
.backanno  
.end
```

The main difference between my list and SPICE is the names of the nodes along with the location of them. I started from the voltage and followed a path that went to the left of the voltage.

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D. Refer to the circuit in Figure 3.5. Solve for the voltage across the 1k resistor using superposition. Make sure to solve for the following 3 cases: Only V1 present, only V2 present, and both V1 and V2 present. Fill out the column corresponding to Part D in Table 3.1. Show all steps to receive full credit.

D)

$V_a = \frac{V_a - 4}{5.1k} + \frac{V_a}{2k} + \frac{V_a - V_b}{1k} = 0$

 $\frac{V_a - 4}{5.1} + \frac{V_a}{2} + \frac{V_a - V_b}{1} = 0$
 $V_a(1.696) - V_b = 0.784 \quad \textcircled{1}$

$V_b = \frac{V_b - V_a}{1} + \frac{V_b}{5.1} + \frac{V_b}{2} = 0$

 $-V_a + V_b(1.696) = 0 \quad \textcircled{2}$

$V_a = 0.7086 \text{ V}$
 $V_b = 0.4178 \text{ V}$

$V' = V_a - V_b = 0.7086 - 0.4178 = 0.2908 \text{ V}$

$V_a = \frac{V_a - 4}{5.1} + \frac{V_a}{2} + \frac{V_a - V_b}{1} = 0 \quad \textcircled{1}$

$V_a(1.696) - V_b = 0 \quad \textcircled{1}$

$V_b = \frac{V_b - V_a}{1} + \frac{V_b}{5.1} + \frac{V_b - 3}{2} = 0$

 $-V_a + (1.696)V_b = 1.5 \quad \textcircled{2}$

$V_a = 0.883 \text{ V}$
 $V_b = 1.356 \text{ V}$

$V'' = V_b - V_a = 1.356 - 0.883 = 0.556 \text{ V}$

$V_{1k\Omega} = V' + V''$
 $= 0.2908 + (-0.556) = -0.2656 \text{ V}$

$\frac{V_a - 4}{5.1} + \frac{V_a}{2} + \frac{V_a - V_b}{1} = 0 \rightarrow 1.696 V_a - V_b = 0.784 \quad \textcircled{1}$

$\frac{V_b - V_a}{1} + \frac{V_b}{5.1} + \frac{V_b - 3}{2} = 0 \rightarrow -V_a + 1.696 V_b = 1.5 \quad \textcircled{2}$

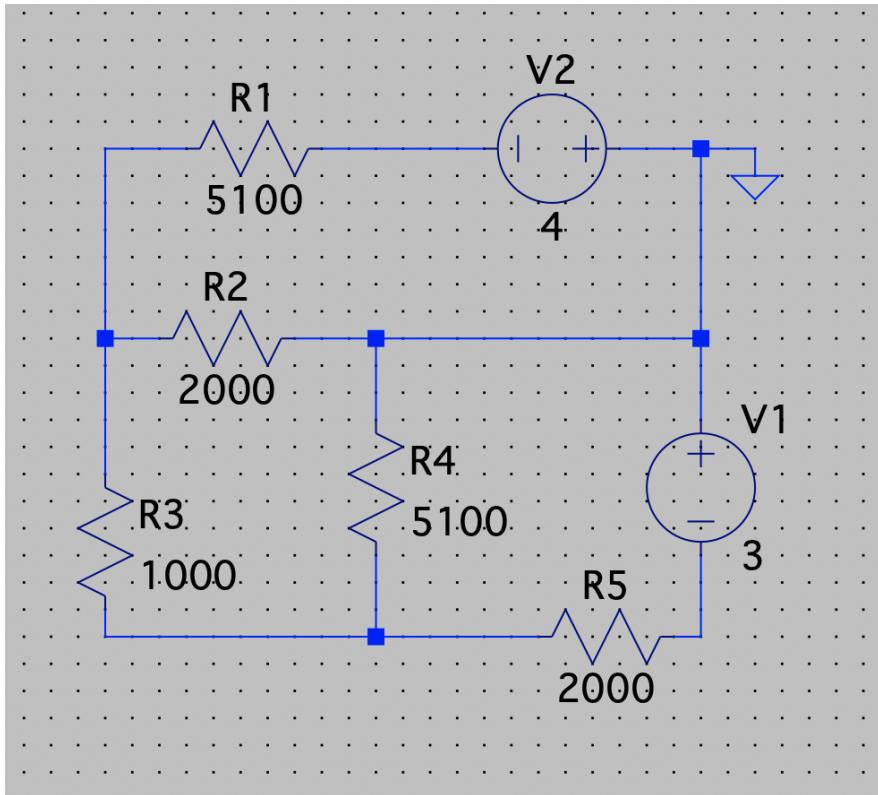
$V_a = 1.508 \text{ V} \quad V_b = 1.773 \text{ V}$

$V_{1k\Omega} = V_a - V_b = 1.508 - 1.773 = -0.265 \text{ V} \quad \checkmark$

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E. Simulate the circuit in Figure 3.5 in SPICE. Print your schematic with all voltages and currents displayed to hand into your TA. You can test the superposition principle by running 2 more simulations: one with V1 replaced with a short and one with V2 replaced with a short. You do not need to print all of the schematics to turn in. However, you should run the simulations and fill out the entries in Table 3.1. Keep a copy of your results to use when you prepare your lab report.



F. Simulate the circuit in Figure 3.6. You will want to use part 1N4148 for the diode in SPICE (In Multisim, you will find part 1N4148 under “switching diodes”). Print the schematic with voltages and currents displayed to hand into your TA. Again, test the superposition principle by running 2 more simulations: first with V1 replaced with a short (or a 0v source) and second with V2 replaced with a short (or a 0v source). You do not need to print all of the schematics to turn in. Finish filling out Table 3.1.

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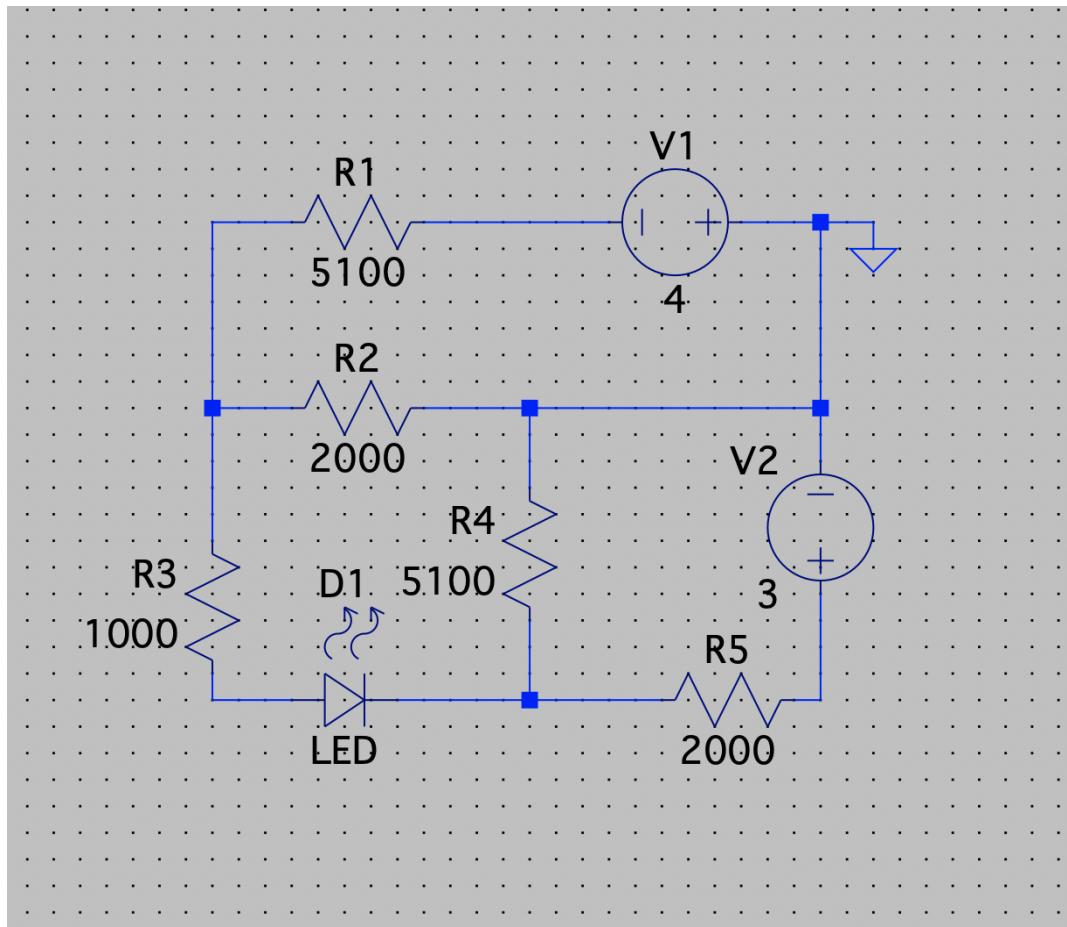


Table 3.1

VL (voltage over the 1k resistor)	Calculation Part D (No diode)	SPICE Part E (No diode)	SPICE Part F (with diode)
1. V1 & V2 Present	0.265 V	-0.938V	2.156V
2. V1 only	0.2908 V	-1.356V	2.156V
3. V2 only	0.556 V	418mV	194.3mV
4. Add line 2 & 3	0.8468 V	-0.938V	2.35V
5. % difference between line 1 and line 4	66%	0.011%	8.27%