

Intro to ECSE

Quiz 1

Fall 2021

1.	/30
2.	/12
3.	/8
Total	/50

Name _____

Notes:

SHOW ALL WORK. BEGIN WITH FORMULAS, THEN SUBSTITUTE VALUES AND UNITS. No credit will be given for numbers that appear without justification. Use the backs of pages if there is not enough room on the front.

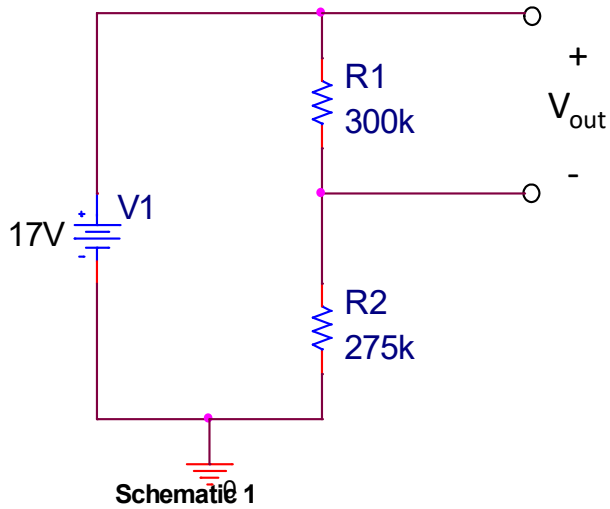
For partial credit on some questions, you may want to re-draw circuit diagrams as you simplify the circuits.

Many problems can be solved using more than one method. Check your answers by using a second method.

At least skim through the entire quiz before you begin and then start with the problems you know best. The proctor will only answer clarification questions where wording is unclear or where there may be errors/typos. No other questions will be responded to.

Problem 1 (30 pts) - Voltage Dividers, Series and Parallel Resistors, Ohm's law

1.1: (4 pts) Find the voltage V_{out} in the circuit below.



V_{out}	(V)
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1.2 (3 pts) Find the current through R2 using **Schematic 1** above.

I_{R2}	(A or mA) Circle one
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1.3 (4 pts) Circle all statements that are true about **Schematic 1 above**. You **MUST** briefly write your explanation why you did or did not circle all statements for full credit. Assume every statement is the only change made.

Please write why below for full credit!

To increase the current through R2 I can:

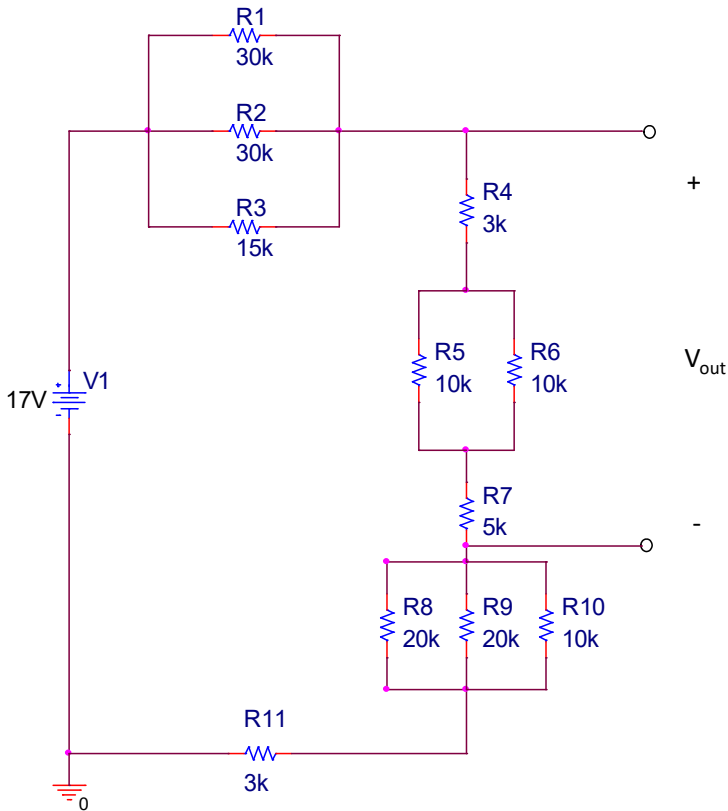
Put another resistor, R3, in parallel with R1

Increase the resistance of R2.

Put another resistor, R3, in parallel with R2.

Increase the source voltage.

1.4: (6 pts) **Reduce the circuit to 3 resistors (in a way to make it easy to find V_{out})**. Redraw the circuit and label the circuit with the appropriate component values. **Include the label for V_{out} .**



Schematic 2

Your redrawn circuit schematic below:

Include any calculations to reduce the circuit for full credit!

1.5: (3 pts) Find the value of V_{out} in your redrawn schematic:

V_{out}	(V)
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1.6: (4 pts) Using your **redrawn schematic from Schematic 2**, find the total current from the 17V source (total source current).

I_{V1}	(A or mA) Circle one
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1.7: (2 pts) Using your **redrawn schematic from Schematic 2**, find the current through R4.

I_{R4}	(A or mA) Circle one
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1.8: (4 pts) Using your **redrawn schematic from Schematic 2**, find the current through R5.

I_{R5}	(A or mA) Circle one
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Problem 2 (12 pts) - Experimental Setup and the M1K Board

2.1: (4 pts) 4-band Resistor values

Color	Value	Multiplier	Tolerance
Black	0	$\times 10^0$	$\pm 20\%$
Brown	1	$\times 10^1$	$\pm 1\%$
Red	2	$\times 10^2$	$\pm 2\%$
Orange	3	$\times 10^3$	$\pm 3\%$
Yellow	4	$\times 10^4$	-0%, +100%
Green	5	$\times 10^5$	$\pm 0.5\%$
Blue	6	$\times 10^6$	$\pm 0.25\%$
Violet	7	$\times 10^7$	$\pm 0.10\%$
Gray	8	$\times 10^8$	$\pm 0.05\%$
White	9	$\times 10^9$	$\pm 10\%$
Gold	-	$\times 10^{-1}$	$\pm 5\%$
Silver	-	$\times 10^{-2}$	$\pm 10\%$

What are the colors of the bands for the following resistor values:

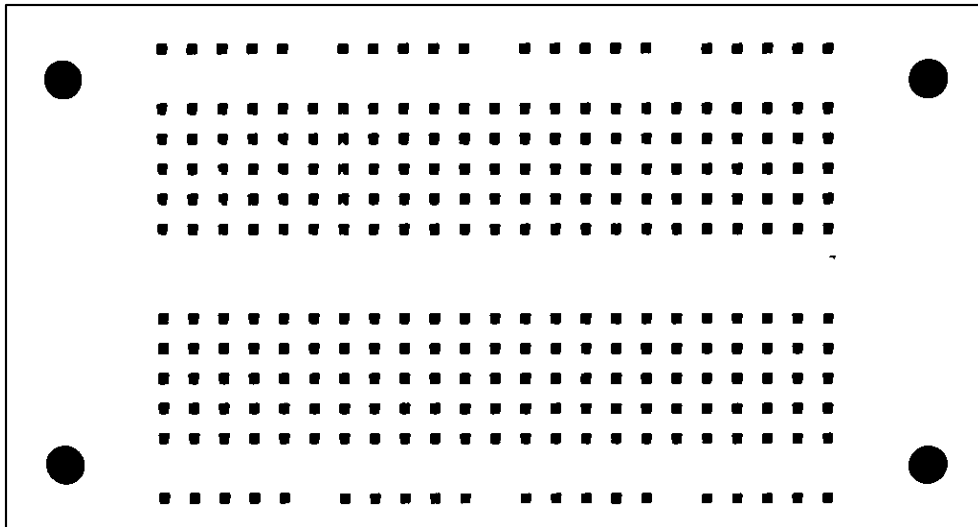
350 ohm $\pm 5\%$

write colors in sequence here

74 kohm $\pm 10\%$

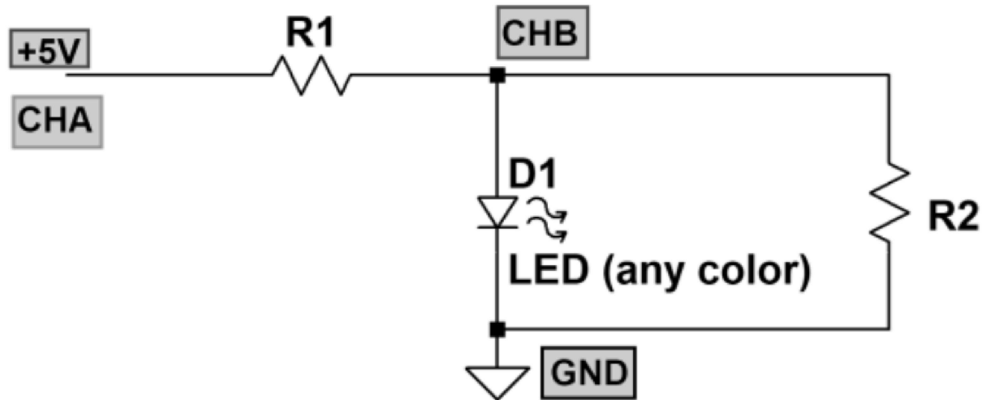
write colors in sequence here

2.2: (2 pts) Breadboards



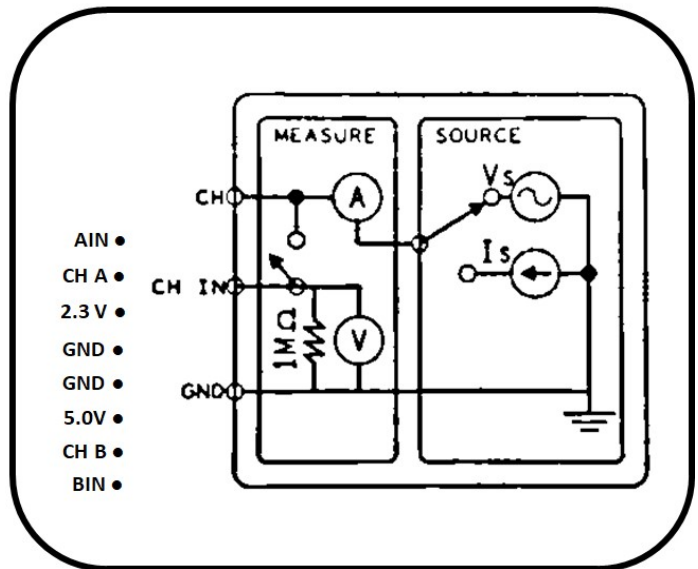
Draw a two lines above that demonstrate how the breadboard is connected. Be sure to ***draw your line through all holes that are connected in your choices.***

2.3: (4 pts) M1K DC Measurement



In this circuit above, what M1K pinouts are you using?
 (The colors on the M1K are inverted for easier reading)

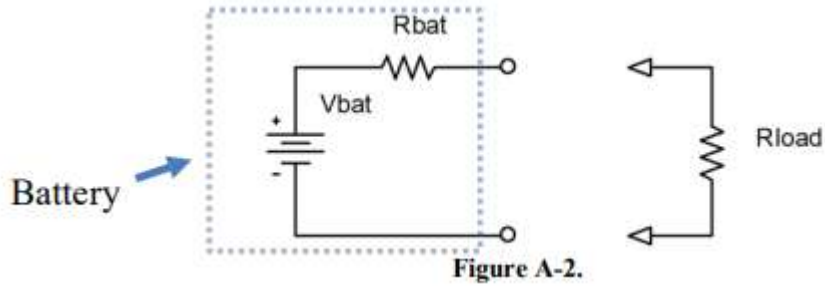
You may point to the pinout and label with notation shown in gray boxes in the schematic.



2.4: (2 pts) How would you change the switches to source current instead of voltage but keep a voltmeter measurement?

Problem 3 (8 pts) - Source Characterization

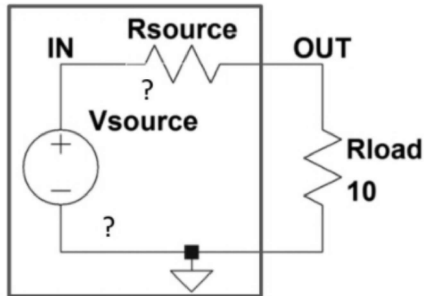
3.1: (2 pts) What equation will help determine the internal resistance of a battery (value of R_{bat})?



Write equation below:

3.2: (3 pts) Batteries can be modeled by combining an ideal voltage source and a resistor. The trials below are experimental values after connecting different loads to the battery.

Find the source voltage V_{source} (in Volts) using the chart below. **Circle what helped you determine this in the chart.**
Write any explanation of why you circled it for full credit!



Explanation(s) below:

Trial	Rload (ohms)	V(out)
1	68Ω	1.588V
2	100Ω	1.682V
3	150Ω	1.712V
4	200Ω	1.753V
5	250Ω	1.819V
6	500Ω	2.232V
7	750Ω	2.721V
8	1KΩ	3.878V
9	2KΩ	4.417V
10	10KΩ	4.476V
11	20KΩ	4.495V

3.3: (3 pts) Find the source resistance (Rsource).

R_{source}	(ohms)
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