

EE 105 Fall 2025

Homework 2 – upload to grade scope

(Due September 25, before class, late submission will incur 20% points/day penalty)

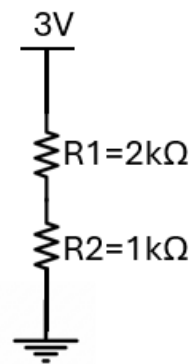
Instructions: Perform the following tasks based on the circuits and concepts discussed in class. Be sure to show all work where applicable.

Problem 1: Describe the function of the touchpad used in class. What are the sensor and processing components involved?

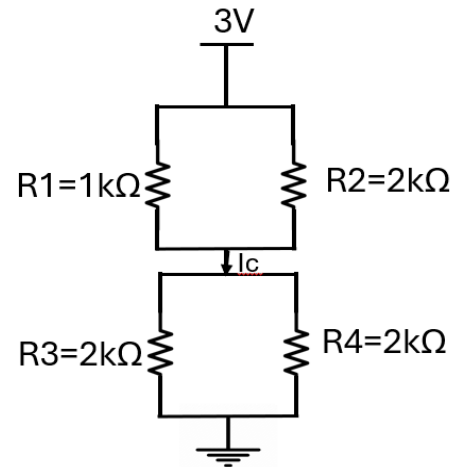
Problem 2: Define the following electrical quantities and their units, Draw their corresponding circuit symbols.

- Voltage
 - Current
 - Resistance
 - Capacitance
 - Inductance
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Problem 3: Analyze the following circuits and calculate the voltage and current across R_1 and R_2 . V_{R1} , I_{R1} , V_{R2} , I_{R2} =?



Problem 4: Given the circuit below, calculate the voltage and current across the R1, R2, R3 and R4:

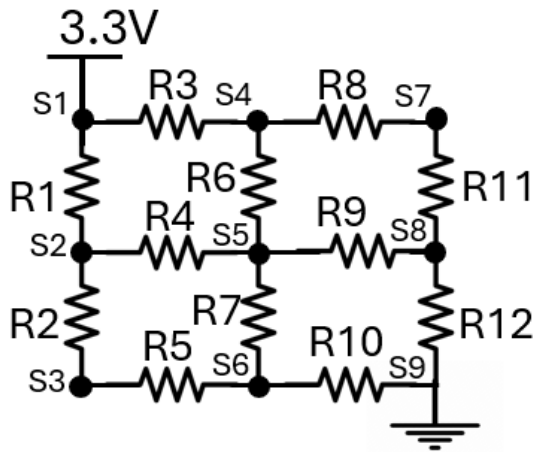


- $V_{R1}, I_{R1}, V_{R2}, I_{R2}, V_{R3}, I_{R3}, V_{R4}, I_{R4}$.
 - What is the value of the I_C ?
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Problem 5:

- a) In the given circuit, calculate the voltage values at each node (S_1 to S_9), and the current through each branch (I_1 to I_{12}) using python.

$$R_1 = R_2 = R_3 = R_4 = R_5 = R_6 = R_7 = R_8 = R_9 = R_{10} = R_{11} = R_{12} = 100\Omega$$

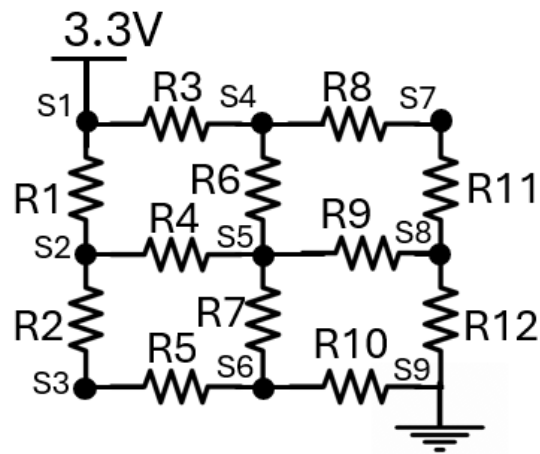


b) If

$$R_1 = R_2 = R_6 = R_7 = R_{11} = R_{12} = 100\Omega$$

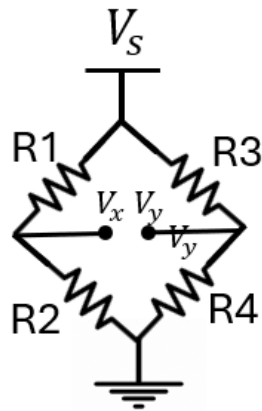
$$R_3 = R_4 = R_5 = R_8 = R_9 = R_{10} = 50\Omega$$

calculate the voltage values at each node (S_1 to S_9), and the current through each branch (I_1 to I_{12}) using python.

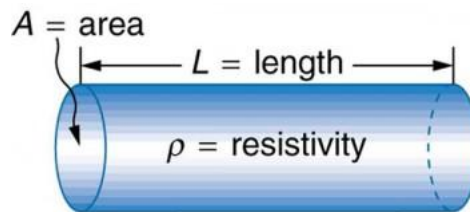


- c) What is the difference between the circuit in a) and b). Which one should you use for the touchpad application and why?
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Problem 6: Derive the equation for $V_x - V_y$.



Problem 7: Consider a cylindrical resistance of length $l=10$ cm, radius $r=1$ mm, and resistance of $R=0.54\text{m}\Omega$. Pick the resistivity of the cylindrical resistance from below.



- a) $1.7 \times 10^{-5} \Omega m$
 - b) $1.7 \times 10^{-6} \Omega m$
 - c) $1.7 \times 10^{-8} \Omega m$
 - d) $5.4 \times 10^{-9} \Omega m$
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Problem 8: By what factor does the resistance of a rectangular block change if you double each dimension of the block?

- a) 1
 - b) 2
 - c) $\frac{1}{2}$
 - d) $\frac{1}{4}$
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Problem 9: Given the circuit below, calculate the voltage values of V_{R1} , V_{R2} , V_{R3} , V_{R4} , V_{R5} , V_{R6} .

