# ESC201A Assignment 1

## Instructor: Abhishek Gupta

## 2023-2024 I Semester

## Topics

Circuit Analysis, Votage/current division, KCL-KVL, nodal and mesh analysis, superposition

## Questions

1. The digital multimeter (DMM) is a device commonly used to measure voltages. It is equipped with two leads (usually red for the positive reference and black for the negative reference) and an LCD display lead at the top node and the negative lead on the bottom node. Using KCL, explain why would we ideally want a DMM used in this way to have an infinite resistance as opposed to zero resistance.

2. Find the equivalent resistance between X and Y in the circuit shown where $R_1 = 8\Omega$, $R_2 = R_3 = 2\Omega$, $R_4 = 7\Omega$.
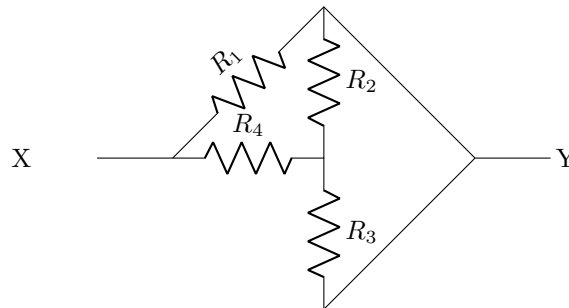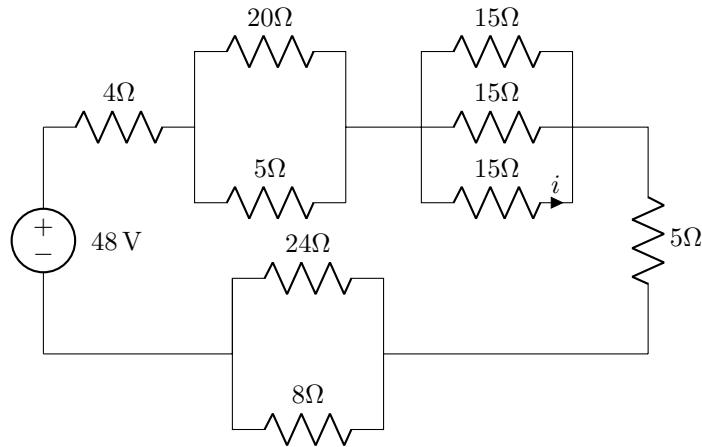


3. For the circuits below, $R_1 = 50\Omega$, $R_2 = 500\Omega$, $R_3 = 100\Omega$, $R_4 = 50\Omega$, $R_5 = 25\Omega$ and $R_6 = 50\Omega$.

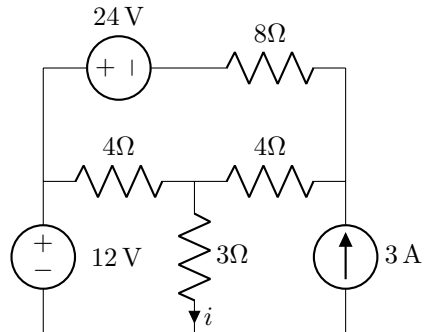    (a) Use current division to find current $i$ through $R_5$.
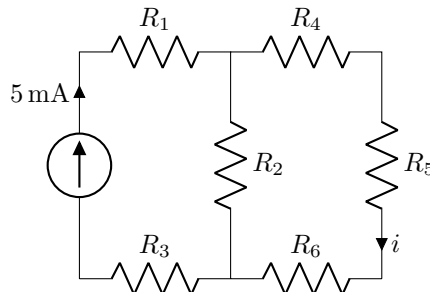


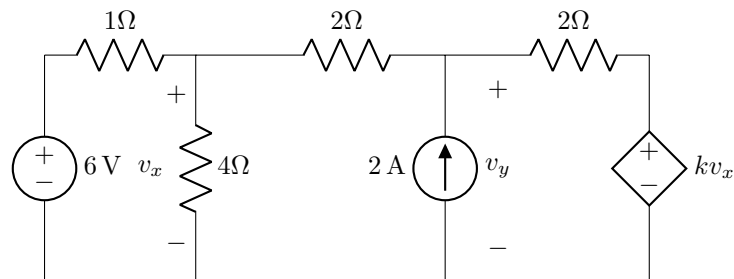    (b) Use voltage division to find voltage $v$ across $R_2$.
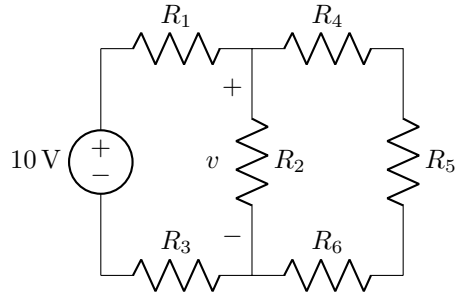
4. Use the concept of series/parallel resistances and voltage and current division to determine the current $i$ in the circuit shown below.



5. Use superposition theorem to solve for current $i$ in the circuit shown below.



6. In the given circuit, use nodal analysis to find the value of $k$, that will cause $v_y$ to be zero.

7. Three appliances — an 850W coffee maker, a 1200W microwave oven, and a 900W toaster — are connected in parallel to a 120V circuit with a 15A circuit breaker.

   (a) Draw a schematic diagram of this circuit.

   (b) Which of these appliances can be operated simultaneously without tripping the circuit breaker?

8. Find $V_0$ using Nodal Analysis.