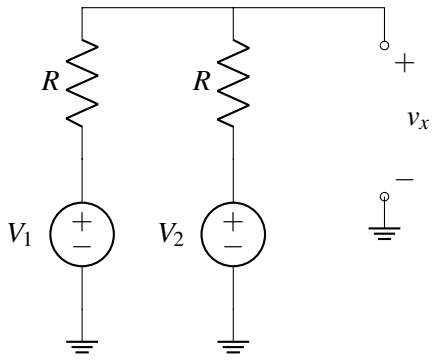
EECS 16A Designing Information Devices and Systems I
Fall 2019 Discussion 10A

1. Dividers for Days

(a) Solve the following circuit for v_x.



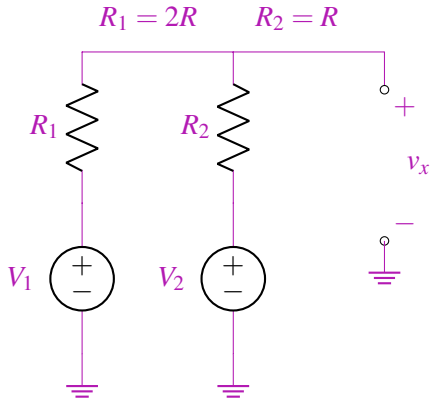
Answer:

$$v_x = \frac{1}{2}V_1 + \frac{1}{2}V_2$$

(b) You have access to two voltage sources, V_1 and V_2. You can use two resistors (as long as $0 \leq R < \infty$). How would you design a circuit that produces a voltage $v_x = \frac{1}{3}V_1 + \frac{2}{3}V_2$?

Answer:

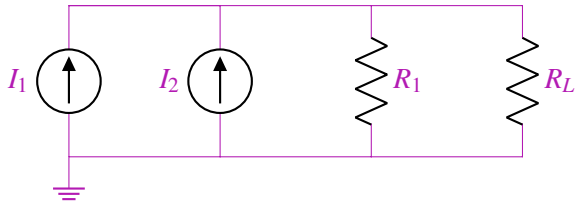
Use superposition. Even if you know the voltage summer, make sure you know the analysis with KVL/KCL. Using any nonzero values for R:



(c) You have two current sources I_1 and I_2. You also have a load resistor $R_L = 6\,\text{k}\Omega$. Similar to the first part, you can use whatever resistors you want (as long as they are finite integer values). How would you design a circuit such that the current running through R_L is $I_L = \frac{2}{5}(I_1 + I_2)$?

Answer:

Use superposition, so think of the two currents as one summed current. Use KCL to determine how to divide the currents.

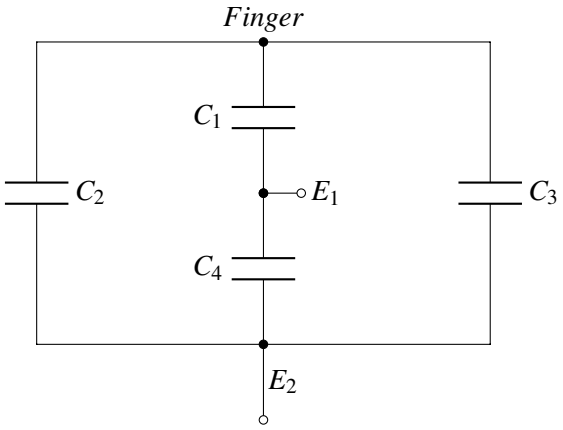


$R_L = 6\,\text{k}\Omega, R_1 = 4\,\text{k}\Omega$

2. Redraw and Calculate Equivalent Capacitance (CIRCUIT FROM FA18 MT2 Q6)

(a) (7 points) **For the rest of this problem, use the circuit below to model the capacitive touchscreen.** You are now given that $C_1 = 8F$, $C_2 = 4F$, and $C_3 = 4F$, $C_4 = 4F$.

(Note: *8F is a very large capacitance. Normal capacitance values would be on the order of nano-Farads, which are* 10^{-9} *of a Farad.*)



Calculate the equivalent capacitance of the circuit between terminals E_1 and E_2.

Answer: REDRAW THE CIRCUIT!!!! $C_{eq} = ((C_2 + C_3)||C_1) + C_4 = 8F$

3. Modeling an IV Characteristic

IGNORE THIS PROBLEM, THIS PROBLEM HAS BEEN CUT FROM THE DISCUSSION WORKSHEET AND IS NOT IN SCOPE

