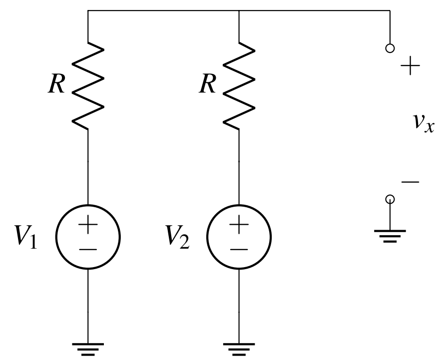
EECS 16A Designing Information Devices and Systems I
Spring 2019 Discussion 10A

1. Practice: Dividers for Days

(a) Solve the following circuit for v_x.

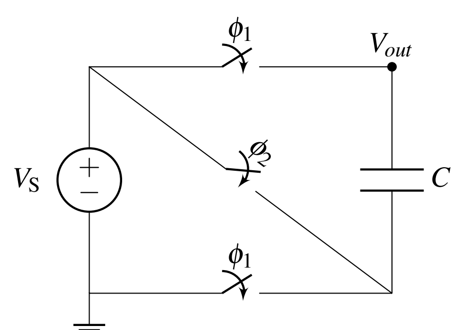


(b) You have access to two voltage sources, V_1 and V_2. You can use two resistors (as long as $0 \leq R < \infty$). How would you design a circuit that produces a voltage $v_x = \frac{1}{3}V_1 + \frac{2}{3}V_2$?

(c) You have two current sources I_1 and I_2. You also have a load resistor $R_L = 6\,\mathrm{k}\Omega$. Similar to the first part, you can use whatever resistors you want (as long as they are finite integer multiples of $1\,\mathrm{k}\Omega$). How would you design a circuit such that the current running through R_L is $I_L = \frac{2}{5}(I_1 + I_2)$?

2. Voltage Booster

We have made extensive use of resistive voltage dividers to reduce voltage. What about a circuit that boosts voltage to a value greater than the supply $V_S = 5V$? We can do this with capacitors!



(a) In the circuit above switches ϕ_1 are initially closed and switch ϕ_2 is initially open. Calculate the value of the output voltage, V_{out} with respect to ground, and the amount of charge stored on capacitor, C, at that state (phase 1).

(b) Now, after the capacitors are charged, switches ϕ_1 are opened and switch ϕ_2 is closed. Calculate the new voltage output voltage, V_{out}, at steady state.