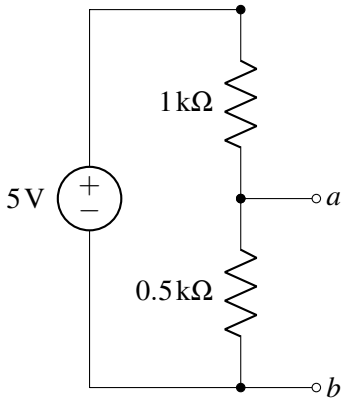
EECS 16A Designing Information Devices and Systems I
Spring 2020 Discussion 9A

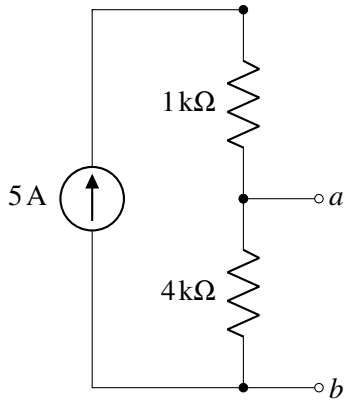
1. Equivalence

Find the Thévenin and Norton equivalents across terminals a and b for the circuits given below.

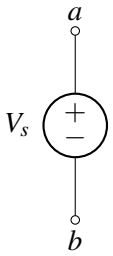
(a)



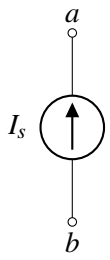
(b)



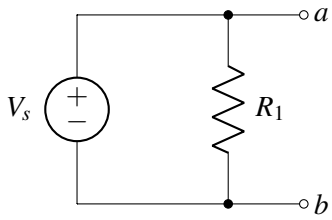
(c)



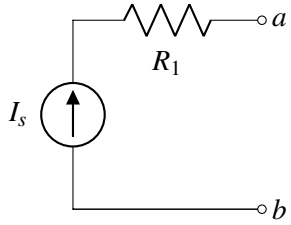
(d)



(e) (Practice)

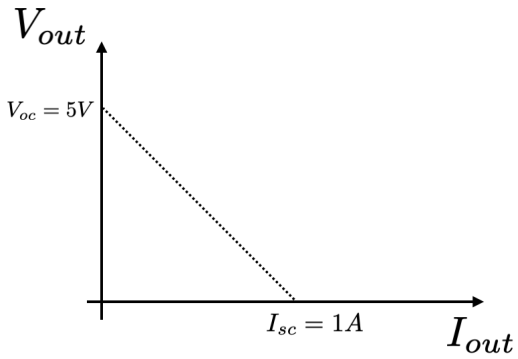


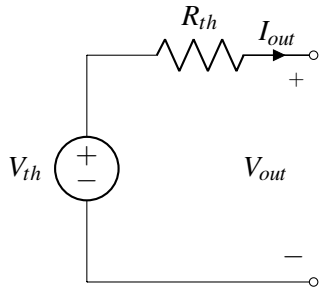
(f) (Practice)



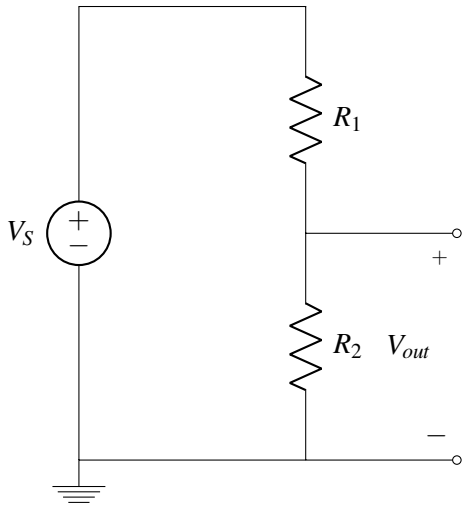
2. Thevenin equivalence

(a) You are given the following $I_{out} - V_{out}$ characteristic of the Thevenin model of a circuit. Find the Thevenin voltage and the Thevenin resistance.



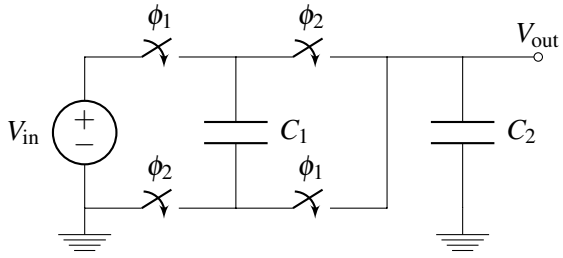


(b) You are given a voltage divider as shown below. Find R_1 and R_2 such that the Thevenin equivalent model is the same as that of (a). You are given that $V_S = 10V$.



3. Charge Sharing

Consider the circuit shown below. In phase ϕ_1, the switches labeled ϕ_1 are on while the switches labeled ϕ_2 are off. In phase ϕ_2, the switches labeled ϕ_2 are on while the switches labeled ϕ_1 are off.



(a) Redraw the circuit in phase ϕ_1. Label the voltages across each capacitor and find the charge on and voltage across each capacitor as a function of V_{in}, C_1, and C_2. Assume the capacitors are uncharged before phase ϕ_1.

(b) Redraw the circuit in phase ϕ_2. Label the voltages across each capacitor and find the charge on and voltage across each capacitor as a function of V_{out}, C_1, and C_2.

(c) Find V_{out} as a function of V_{in}, C_1, and C_2.

(d) How will the charges be distributed in phase ϕ_2 if we assume $C_1 \gg C_2$?

