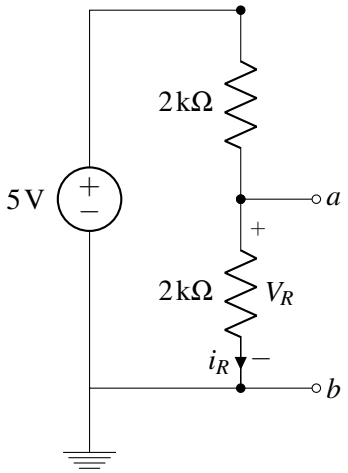
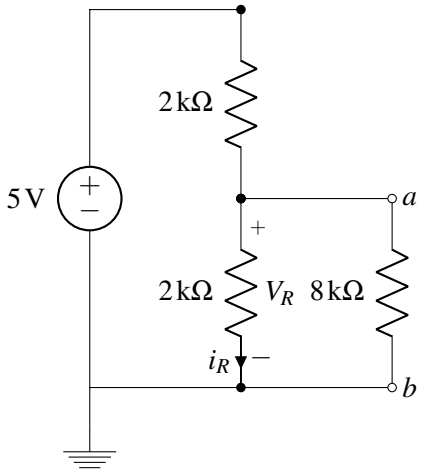
EECS 16A Designing Information Devices and Systems I
Fall 2018 Discussion 8B

1. Why Bother With Thévenin Anyway?

(a) Find a Thévenin eqiuvalent for the circuit shown below.

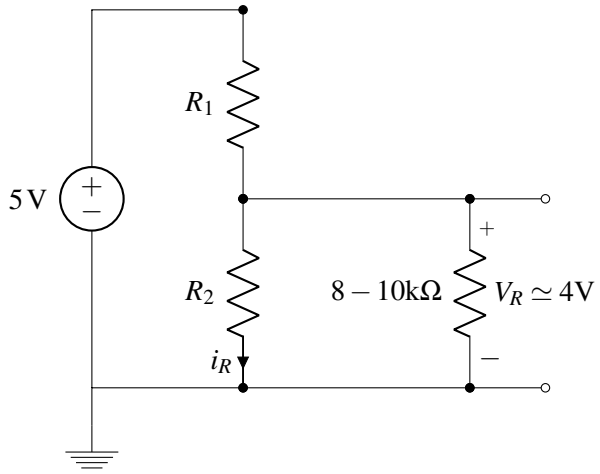


(b) What happens to the output voltage V_{ab} if we attach a load of 8 kΩ to the output as depicted in the circuit below? Use your Thévenin equivalent from part (a).



(c) What if the load is $\frac{8}{3}$kΩ? What if the load is 80 kΩ?

(d) Say that we want to support loads in the range of 8 kΩ to 10 kΩ. We would like to maintain 4 V across these loads. How can we approximately achieve this by setting R_1 and R_2 in the following circuit?

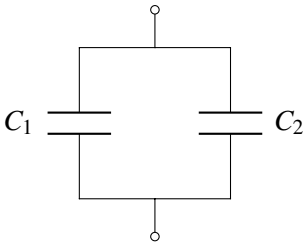


(e) For part (b), how much power does each element dissipate? Calculate the power using your Thévenin equivalent and using the original circuit. Are the values the same?

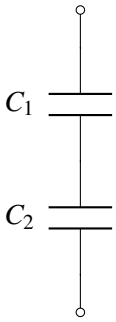
2. Series And Parallel Capacitors

Derive C_{eq} for the following circuits.

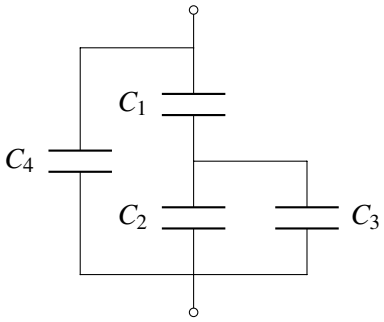
(a)



(b)



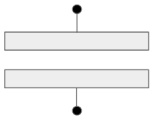
(c)



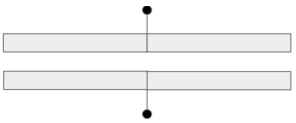
3. Capacitance Equivalence

For the structures shown below, assume that the plates have a depth L into the page and a width W and are always a distance d apart.

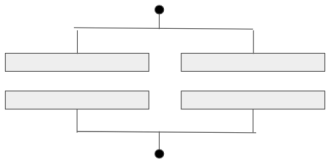
(a) What is the capactance of the structure shown below?



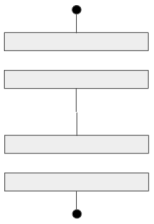
(b) Suppose that we take two such structures and put them next to each other as shown below. What is the capacitance of this new structure?



(c) Now suppose that rather than connecting the together as shown above, we connect them with an ideal wire as shown below. What is the capacitance of this structure?



(d) Suppose that we now take two capacitors and connect them as shown below. What is the capacitance of the structure?



(e) What is the capacitance of the structure shown below?