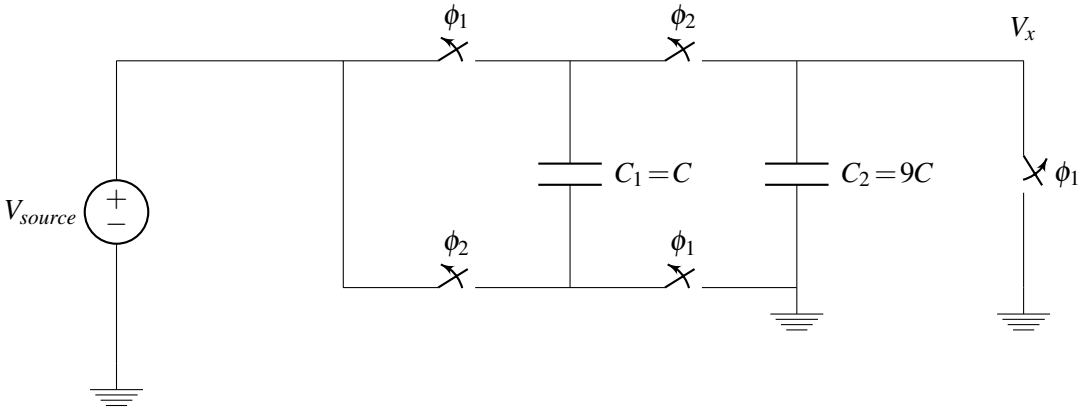
EECS 16A Designing Information Devices and Systems I
Fall 2015 Anant Sahai, Ali Niknejad

Discussion 8B

1. Capacitor Charge Sharing

Consider the following circuit:



In the first phase, all of the switches labeled ϕ_1 will be closed and all switches labeled ϕ_2 will be open. In the second phase, all switches labeled ϕ_1 open and all switches labeled ϕ_2 close.

(a) Draw polarity (+ and - signs) on the two capacitors C_1 and C_2. (It doesn't matter which terminal you label $+$ or $-$; just remember to keep these consistent through phases 1 and 2!)

(b) Draw the circuit in the first phase and in the second phase. Keep your polarity in part (a) in mind.

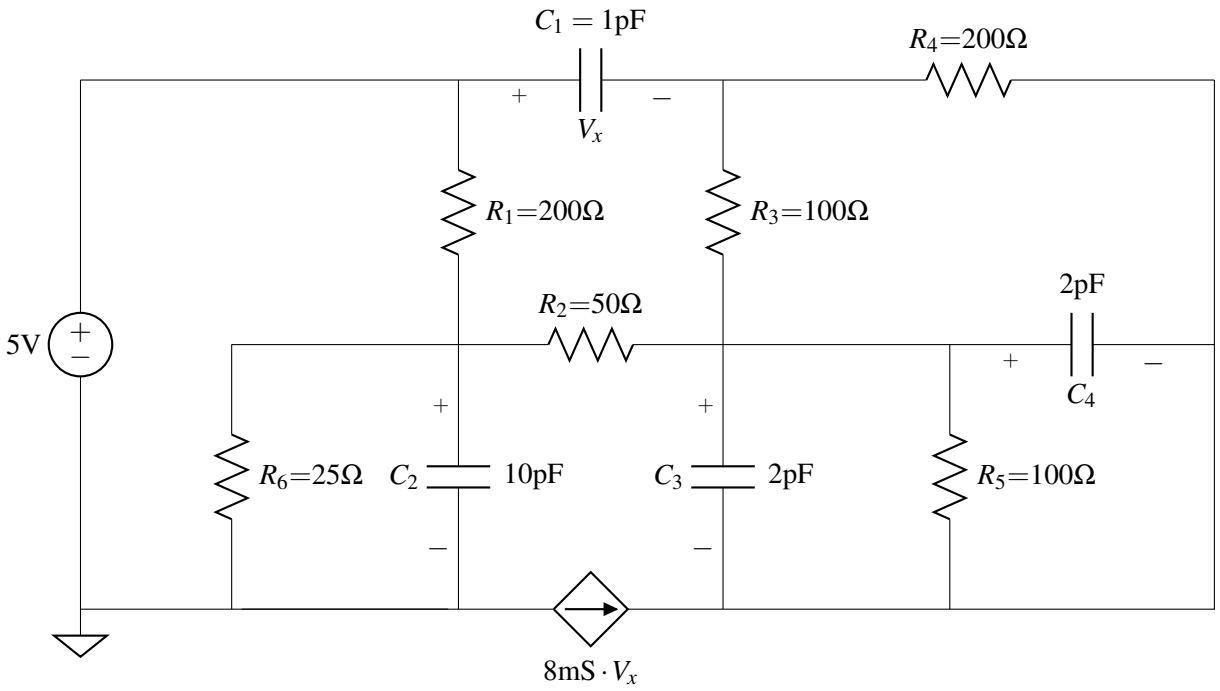
(c) Find the voltages and charges on C_1 and C_2 in the first phase. Be sure to keep the polarities of the voltages the same!

(d) Now, in the second phase, find the voltage V_x.

(e) (BONUS) If capacitor C_2 did not exist (i.e., had a capacitance of 0F), what would the voltage V_x be?

2. Nodal Analysis

(a) Solve the following circuit in steady state using nodal analysis.



(b) After the circuit settles in steady-state from the previous part, disconnect the charged capacitors from the circuit and connect them in the configuration shown below. Polarity from part (a) is preserved. What are the voltages across, currents through and charge stored in each of the capacitors C_1, C_2, C_3 and C_4 in steady-state after the charge redistributes itself?