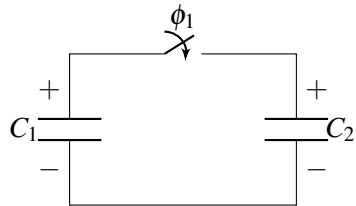

EECS 16A Designing Information Devices and Systems I

Fall 2020 Discussion 9B

1. Capacitors and Charge Conservation

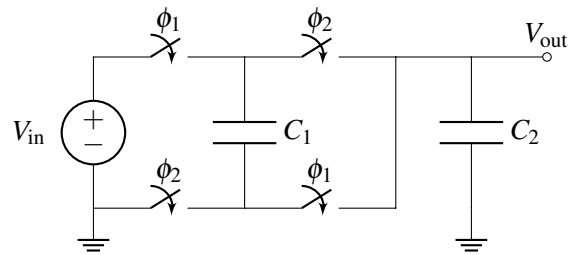
- (a) Consider the circuit below with $C_1 = C_2 = 1 \mu\text{F}$ and an open switch. Suppose that C_1 is initially charged to $+1 \text{ V}$ and that C_2 is charged to $+2 \text{ V}$. How much charge is on C_1 and C_2 ?



(b) Now the switch is closed (i.e. the capacitors are connected together.) What are the voltages across and the charges on C_1 and C_2 ?

2. 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) Draw the polarity of the voltage (using + and - signs) across the two capacitors C_1 and C_2 . (It doesn't matter which terminal you label + or -; just remember to keep these consistent through phase 1 and 2!)

(b) Redraw the circuit in phase ϕ_1 and phase ϕ_2 . Keep your polarity from part (a) in mind.

(c) Find V_{out} in phase ϕ_2 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 $C_1 \gg C_2$?