

ECE 211 Fall 2003

Homework Five

(Due 10/22/03 at the beginning of discussion.)

Problem One:

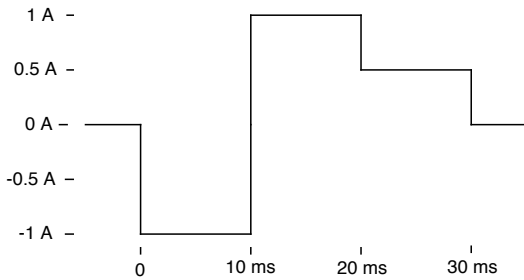


Figure – 1A

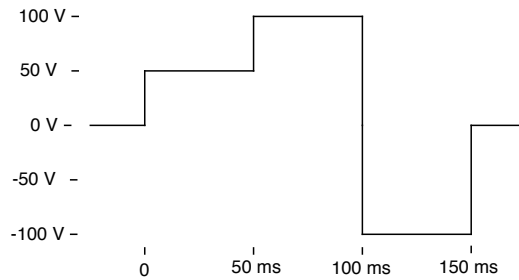


Figure – 1B

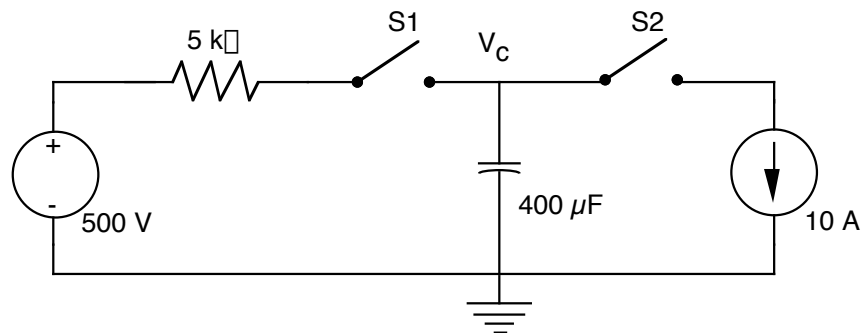
The graph in Figure 1A shows the current flowing into a 100 μF capacitor as a function of time. At time $t=0$, the capacitor voltage is 10 V.

- Draw the capacitor and show the voltage and current polarity / direction.
- Graph the capacitor voltage defined in part a) as a function of time over the same 30 ms as in Figure 1A.

The graph in Figure 1B shows the voltage across a 200 mH inductor as a function of time. At time $t=0$, the inductor current is 5 A.

- Draw the inductor and show the voltage and current polarity / direction.
- Graph the inductor current defined in part b) as a function of time over the same 150 ms as in Figure 1B.

Problem Two:



The above is a camera flash circuit. At time $t=0$, the capacitor voltage $V_c = 0$, the switch S1 is closed and the switch S2 is open. The above is a camera flash circuit. The capacitor voltage is given by:

$$V_c = V_s (1 - e^{-t/RC})$$

Where t is time, V_s is the source voltage (500V), R is the series resistance (5 $\text{k}\Omega$), and C is the firing capacitance (400 μF). When the capacitor is charged to 300 V, the switch S1 is opened and the switch S2 is closed. The flash bulb is represented by the 10 A current source. A total energy of 10 J is delivered to the flash bulb.

- How long does it take the capacitor to charge to 300 V?
- What is the capacitor voltage when 10 J has been delivered to the flash bulb?
- How long does it take to deliver the 10 J?