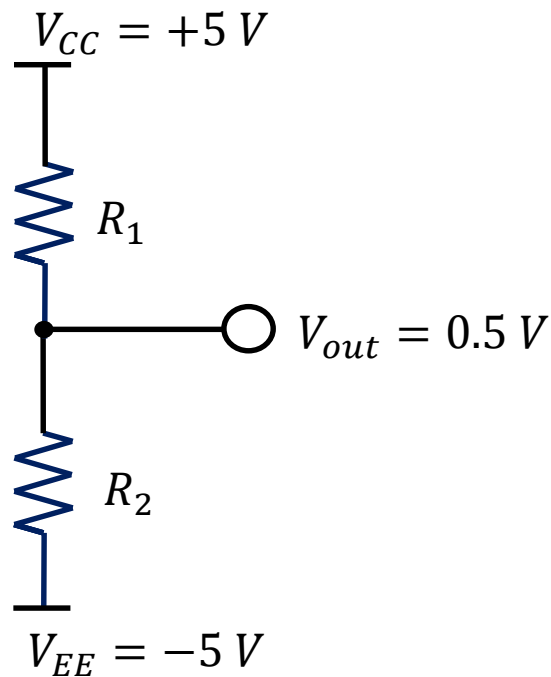


Physics 53600 Midterm Exam – February 25th 2020

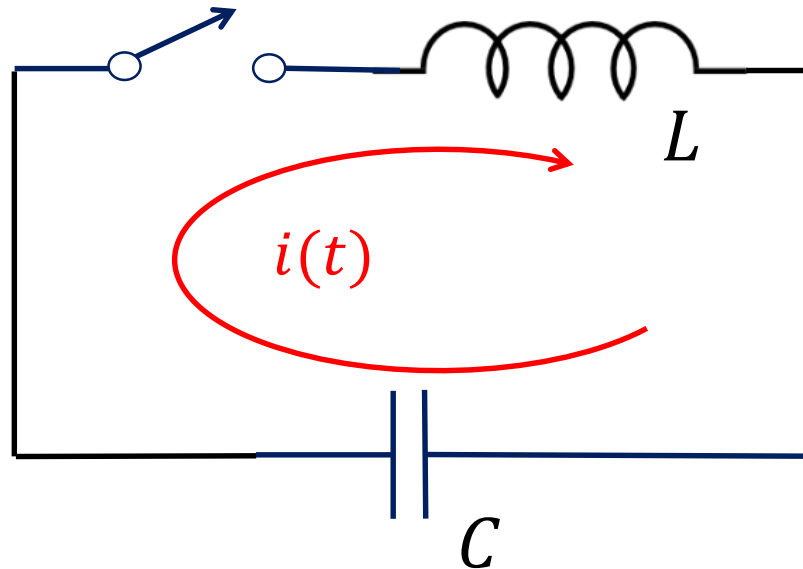
Answer all four questions in the blue booklets provided.

You may use a calculator, but no other materials.

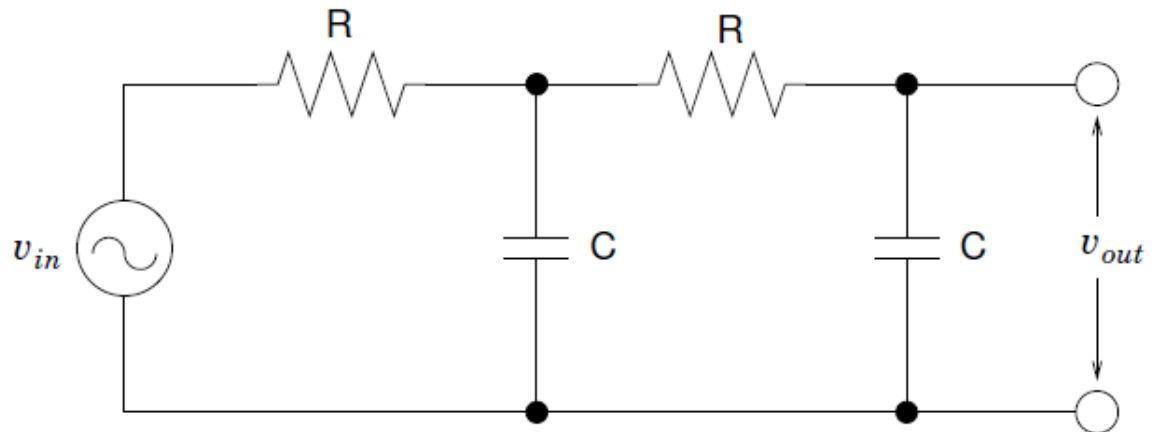
1. Design a voltage divider that provides a voltage source with an un-loaded value of 0.5V and an output impedance of 1 k Ω where the resistors are between positive and negative supplies of +/- 5 volts as shown:



2. Consider the following circuit in which the capacitor initially carries a charge Q_0 . Write down the differential equation that describes the current in the circuit as a function of time after the switch is closed at $t = 0$, and solve the equation using the initial conditions provided.

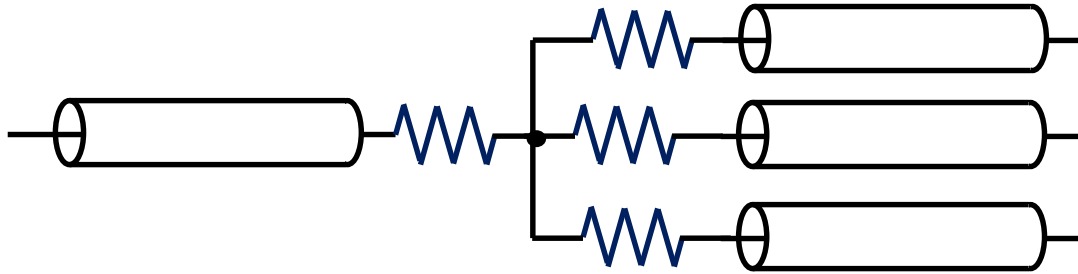


3. Consider the following circuit:



- (a) Is this a high-pass filter or a low-pass filter?
- (b) At what frequency does the gain fall to -3 dB?
- (c) How many dB per decade does the gain drop off?

4. Consider the following configuration of transmission lines:



If all transmission lines have impedance Z_0 and all resistors have resistance R , what value of R will eliminate reflections at the junction between all the transmission lines for any pulse incident on any of them?