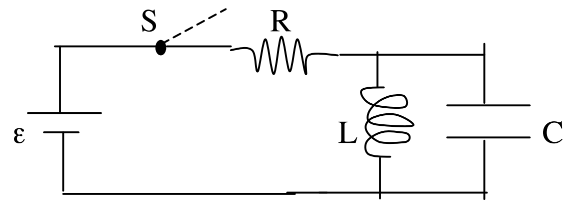
PHYSICS 4C QUIZ 5 (open book) Fall QUARTER 2011
PROF. HIRSCH December 2

**Problem 1** (10 pts)

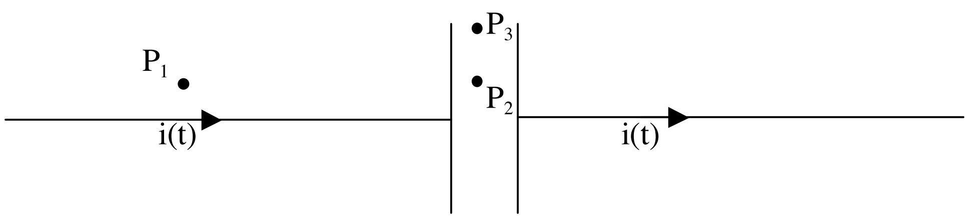



In the circuit in the figure, ε=100V, R=5Ω, L=10mH and C=10mF. The switch S has been closed for a long time. At time t=0 the switch S is opened.
(a) What is the current through the resistor right before S is opened?
(b) What is the charge in the capacitor right before S is opened?
(c) What is the energy stored in the inductor right before S is opened?
(d) What is the maximum charge that will be stored in the capacitor after S is opened?
(e) How long after S is opened will the capacitor for the first time have maximum charge?

**Problem 2** (10 pts)

An alternating emf of amplitude 100V and angular frequency $\omega$=100s$^{-1}$ is connected in series with a 2Ω resistance, a 50mH inductor and a capacitor. The current in this circuit is in phase with the emf.
(a) What is the value of the capacitance of this capacitor?
(b) What is the impedance of this circuit and the amplitude of the current?
(c) What is the maximum voltage across the inductor?

**Problem 3** (10 pts)




The capacitor in the figure is being charged by a straight wire carrying current i(t) connected to a circuit not shown. The capacitor is made of circular plates of radius R that are at distance d=1cm from each other. The point $P_2$ is between the capacitor plates at distace R/2 from the center, the point $P_3$ is at the edge of the capacitor (distance R from the center). The point $P_1$ is at distance R/2 from the wire far from the capacitor. The magnetic field at point $P_1$ at a certain instant is 0.4mT when the current is 200A. At that instant:
(a) What is the magnitude of the magnetic field at point $P_2$?
(b) What is the magnitude of the magnetic field at point $P_3$?
(c) What is the value of dE/dt, where E is the electric field between the capacitor plates? Give your answer in V/(m s). Use $\varepsilon_0=8.85\times10^{-12}C^2/(Nm^2)$, $\mu_0=4\pi\times10^{-7}$T m /A.