EECS 40, Spring 2006
Prof. Chang-Hasnain
Midterm #1

March 2, 2006
Total Time Allotted: 80 minutes
Total Points: 100

1. This is a closed book exam. However, you are allowed to bring one page (8.5" x 11"), double-sided notes
2. No electronic devices, i.e. calculators, cell phones, computers, etc.
3. SHOW all the steps on the exam. Answers without steps will be given only a small percentage of credit. Partial credit will be given if you have proper steps but no final answers.
4. Draw BOXES around your final answers.
5. **Remember to put down units.** Points will be taken off for answers without units.
6. **NOTE: $\mu = 10^{-6}$; $k = 10^3$; $M = 10^6$.**

Last (Family) Name: ____

First Name:____

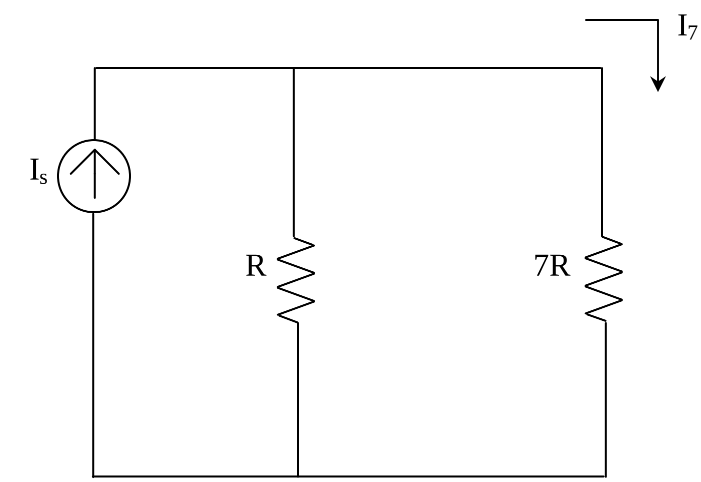
Student ID:____

Signature:____

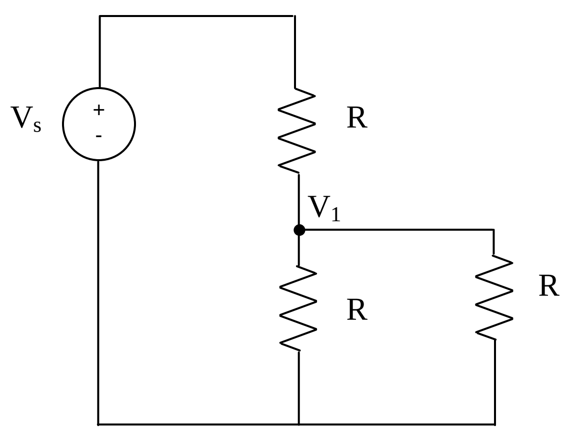
Score:	
Problem 1 (20 pts)	
Problem 2 (30 pts)	
Problem 3 (50 pts)	
Total:	

Problem 1 (20 pts): Resistive Circuits and Capacitors

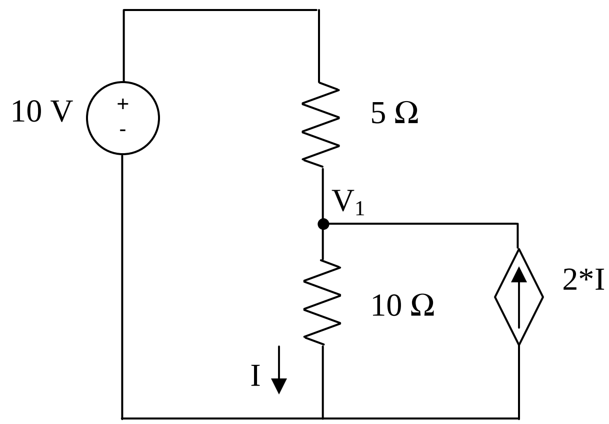
(a) (5 pts) Find I_7 in terms of I_s



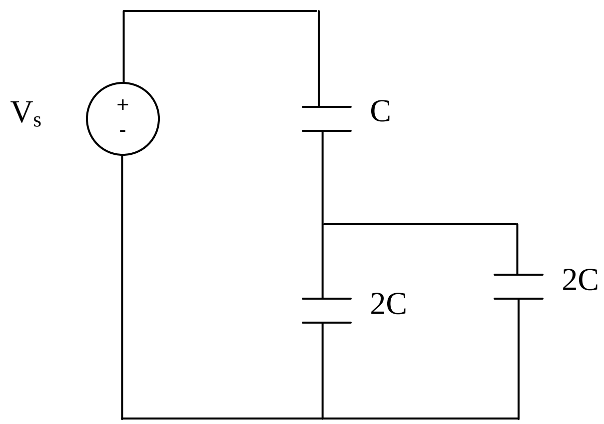
(b) (5 pts) Find V_1 in terms of V_s



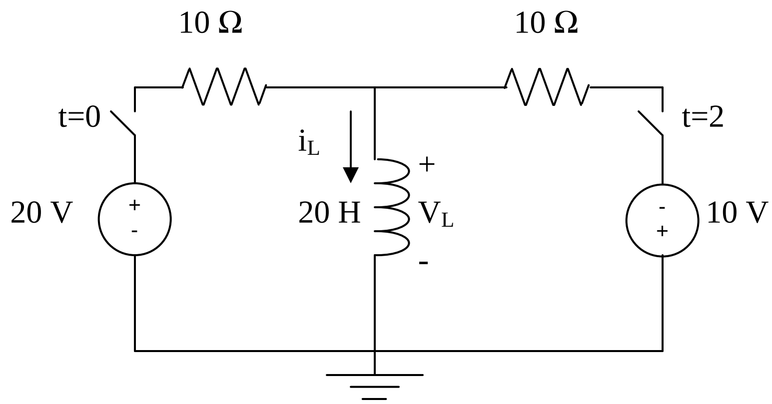
(c) (5 pts) Find Node Voltage V1.



(d) (5 pts) What is the charge and voltage across each capacitor in terms of V_s and C?

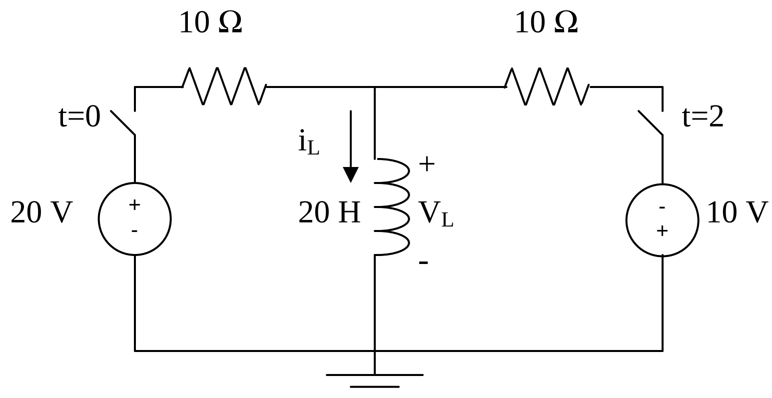


Problem 2 (30 pts): Transient Analysis: 1st order circuit
There are two switches in this circuit and the closing sequence is below:
At $t<0$, both switches are open. The initial condition is $i_L = 0$, $V_L = 0$
At $t=0$, the left switch is closed. During the period $0<t<2$ s, the left switch is closed and the right is open.
At $t=2$ s, the right switch is closed (now both closed). For $t>2$ s, both switches are closed.

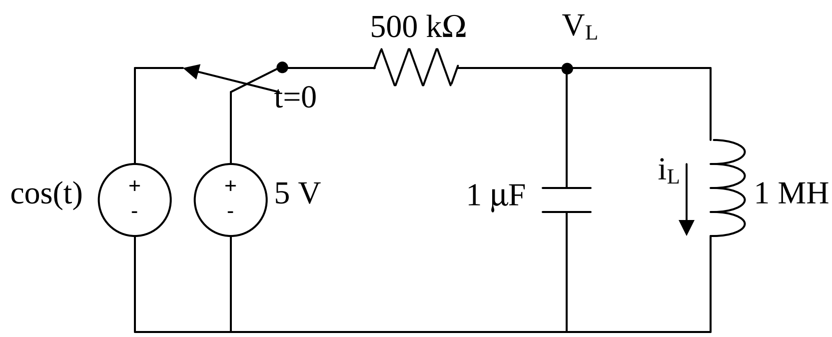


(a) (10 pts) $0<t<2$ s, what is $i_L(t)$? Hint: $e^{-1} = .37$.

(b) (20 pts): t>2 s, what is $i_L(t)$?



Problem 3 (50 pts): For the circuit below:



(a) (5 pts) What are v_L and i_L for t < 0? (Remember units!)

(b) (10 pts) Use KVL/ KCL to show that the differential equation for $v_L(t)$ for t>0 is the following equation. Write enough steps to show you know the material.

$v_L'' + 2v_L' + v_L = -2\sin(t)$

(c) (15 pts) Find the transient solution. What are α, ω_0, and ξ?

Problem 3 continued:
(d) (5 pts) Is this critically damped, underdamped, or overdamped?

(e) (10 pts) What is the particular solution?

(f) (5 pts) What is the complete solution?