Course: ECE 53a
Quiz #2
Instructor: Pamela Cosman
Date: 2/20/08

First Name: _____

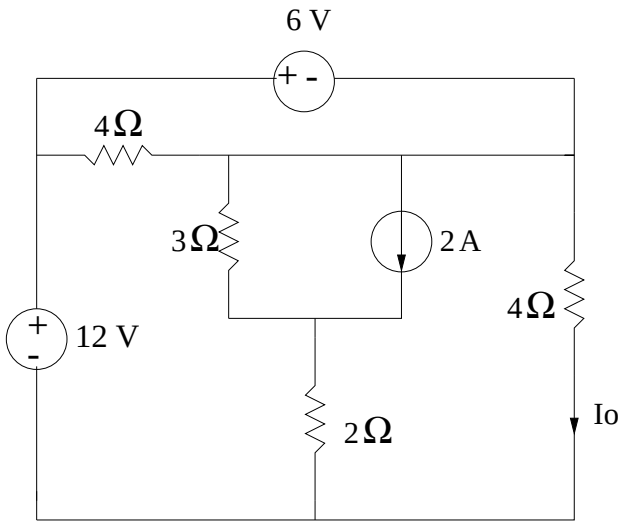
Last Name: _____

There are 4 problems.
Each problem is worth 10 points.

Problem	Possible	Score
1	10	
2	10	
3	10	
4	10	
Total	40	

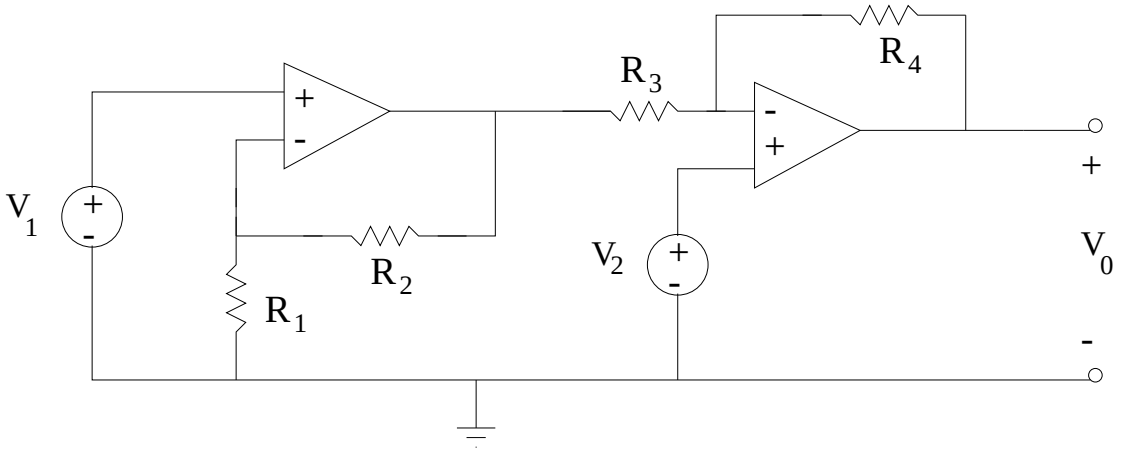
On this quiz you may use one page of notes (8.5 by 11 inches, both sides of the page).
No other notes or books allowed. No calculators.
You need to show your work for all problems.

Problem 1: In the following circuit, find the current I_0 using superposition. Clearly indicate the contribution to I_0 made by each of the power sources.



Problem 2: (a) Given a box of 10-kΩ resistors and an ideal (infinite gain) op-amp, show how to design a circuit that would have an output voltage that equals one third of the input voltage, regardless of the load that might be attached to the output terminals. (b) Suppose it turns out now that the amplifier which you thought could be treated as having infinite gain actually has a gain of only 100. With the circuit configured as you have it in part (a), what is the relation between the input and output voltages?

Problem 3: Find an expression for the output voltage V_0 in terms of the input voltages V_1 and V_2 and the resistor values. Assume that the op amps shown are ideal (infinite gain) operational amplifiers.



Problem 4: For this circuit, suppose that $V(t)$ is described by the function given below. Find expressions for the following 5 things: (a) $I(t)$, (b) $I_R(t)$, (c) $I_S(t)$, (d) the energy stored by the capacitor $W_c(t)$, and (e) the instantaneous power absorbed by the resistor $p_R(t)$. You should not have any variables such as $V(t)$ in your final expressions. (You do not need to sketch any of them).