AMERICAN UNIVERSITY OF BEIRUT
Department of Electrical and Computer Engineering
EECE210 Fall 2004

Quiz 2, December 15, 2004

Prof Karameh

Directions:

- NO PROGRAMMABLE CALCULATORS ARE ALLOWED.
- You will have 1.5 hrs for this quiz.
- Write down your initials *in ink* on all the pages. DO IT NOW!
- Answers must be explained or derived. DO NOT just write down an answer.
- It is a good idea to read the whole test before you begin. Some problems are divided into several parts with percentages indicated. You might be able to solve different parts independently.
- DO NOT talk to any of your colleagues under any circumstances. You will be penalized without warning.

YOUR NAME HERE:

EECE210 - Quiz 2- Fall 2004. **NAME:**

PROBLEM 1 (15%)

Consider the network shown in figure 1. The Switch was at the 20 Ω for a long time for $t < 0$. At t=0, switch is moved to the 10 Ω resistor.

(a) (12 %) Find the current in the inductor $i_L(t)$, $t \geq 0$.

(b) (3 %) Find the maximum energy stored in the inductor.

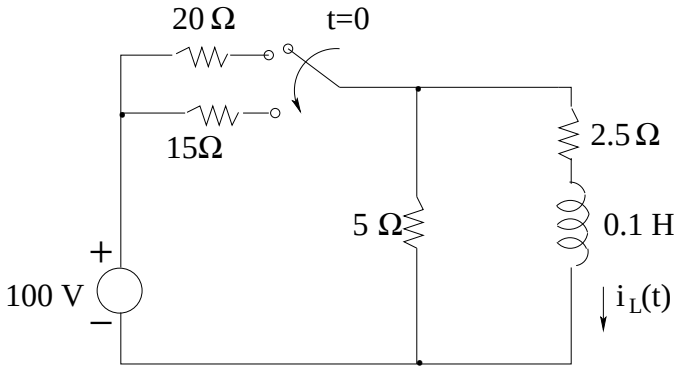

Figure 1: Problem 1

PROBLEM 2 (12%)

Consider the network shown in figure 2. Find the values of resistors R_1, R_3 so that the current supplied by the voltage source V_s is zero for all time. All op-amps are ideal.

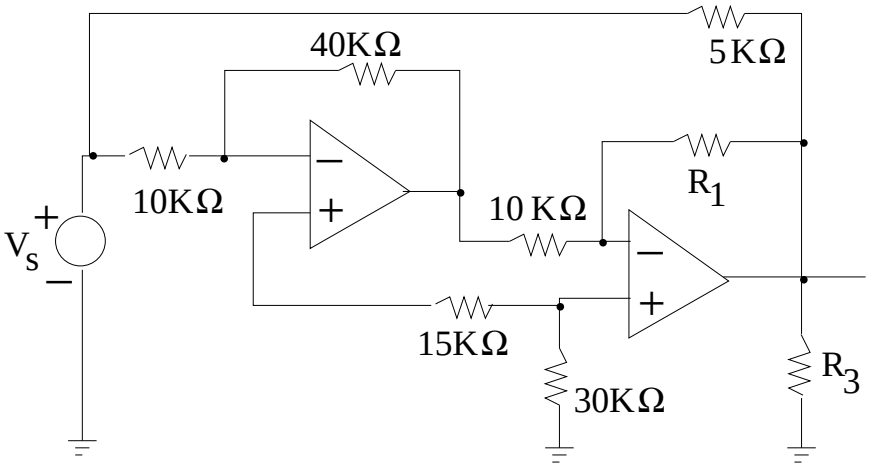

Figure 2: Problem 2

PROBLEM 3 (18%)

Consider the network shown in figure 3.

(a) (4%) Write the differential equations necessary to compute the voltage in the resistor R for any source voltage $v(t)$.

(b) (4%) If $v(t) = 12 - 201e^{-t}$, which, *if any*, of the following currents might actually have came from the circuit?

(1) $i_1(t) = 0.24 - 2e^{-t}$, $i_2(t) = 4e^{-t}$.

(2) $i_1(t) = 0.12 - 4e^{-t}$, $i_2(t) = 3e^{-t}$.

(3) $i_1(t) = 0.24 - 4e^{-t}$, $i_2(t) = 3e^{-t}$.

(c) (10%) Find the Thevenin equivalent circuit for the network to the left of terminals a,b of the resistor. ($v(t) = 100cos100t$ volts).

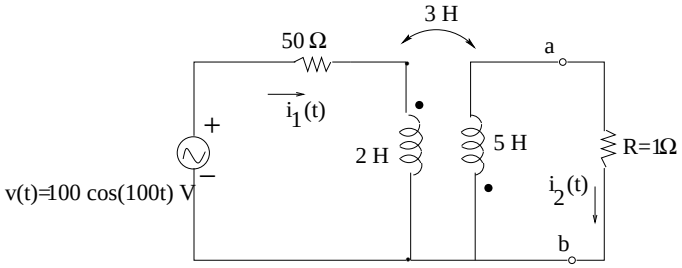

Figure 3: Problem 3

Problem 4 (15%)

Find the output voltages v_1 and v_2 of the ideal op-amps shown in figure 4.

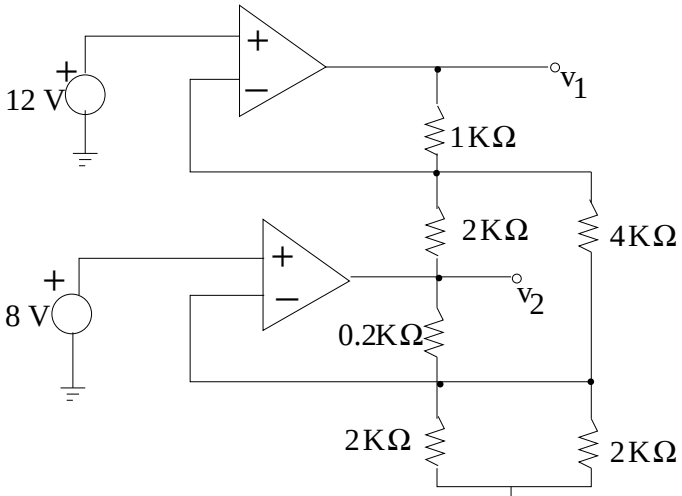

Figure 4: Problem 4

PROBLEM 5 (20%)

For the network shown in figure 5, find the current $i_2(t)$. Show all your work.

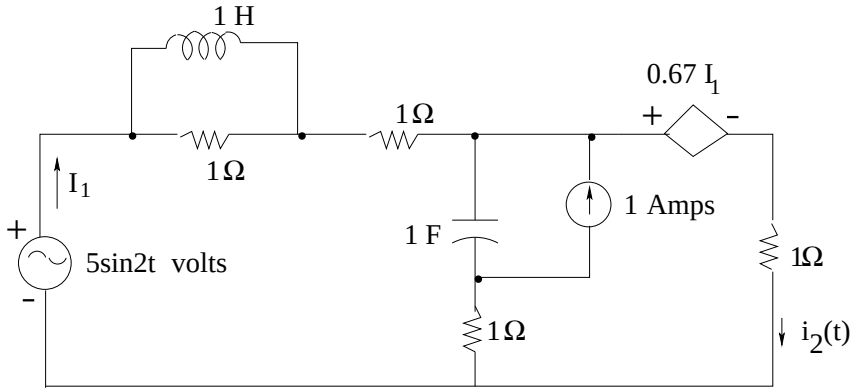

Figure 5: Problem 5

PROBLEM 6 (20%)

Consider the circuit shown in figure 6 below. The switch was open for a very long time $t < 0$. At t=0, switch is closed.

(a) (12 %) **Given:** L=5 H, C=4 F, $R_1 = 3\Omega$, and $R_2 = 2\Omega$. Find the voltage in the capacitor $v_c(t)$ for $t \geq 0$.

(b) (3 %) Is the circuit response you obtained in part (a) underdamped, critically damped, or overdamped? explain.

(c) (5 %) If L= 5 H, C=4 F, find R_1, R_2 such that the circuit response is *critically damped*.

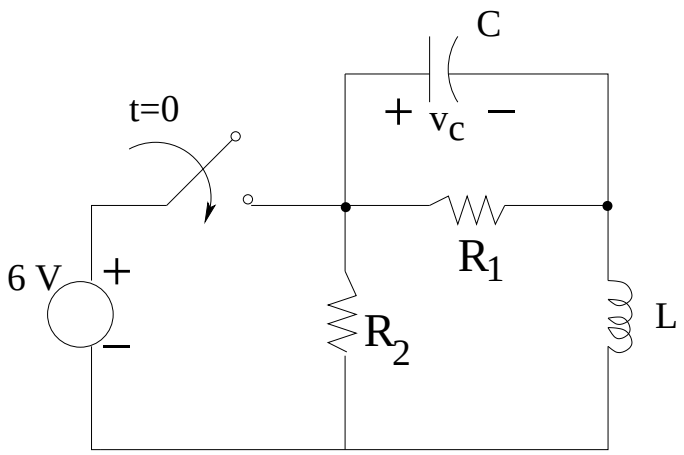

Figure 6: Problem 6