EECS 40, Fall 2007
Prof. Chang-Hasnain

Homework #3

Due at 5:00 pm in 240 Cory on THURSDAY, 9/27/07
Total Points: 100

- Put (1) your name and (2) discussion section number on your homework.
- You need to put down all the derivation steps to obtain full credits of the problems. Numerical answers alone will at best receive low percentage partial credits.
- No late submission will be accepted expect those with prior approval from Prof. Chang-Hasnain.
- Problems of this HW are from Hambley 4th Edition

1. (Inductance and Capacitance) Read the «practical application » on p. 143-144. Answer the question on p. 144 : « Identify the features in Figure PA3.2 that are analogous to each of the circuit elements in Figure PA3.1 ». (8 points)

2. (Inductance and Capacitance) (16 points)
   x(t)= { 0 on (-∞, 1],
   4*t-4 on (1,2),
   -4*t+12 on [2,3)
   0 on [3, ∞) }.
   a. The voltage v(t) and current i(t) across a .5F capacitor adhere to passive convention. Also, V(0) = 0V, and i(0) = 0A. Determine i(t), power, and stored energy when v(t)=x(t) as given above, and sketch. (8 points)
   b. Find an expression for v(t) when i(t)=x(t), and sketch. (4 points)
   c. Suppose instead that we are measuring current and voltage across a 4H inductor. Find an expression for i(t) when v(t)=x(t), and sketch. (4 points)

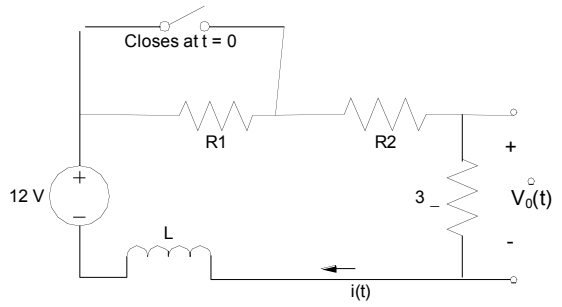
3. P3.33 (Physical Characteristics of Capacitors) (5 points)

4. P3.65 (Inductances in Series and Parallel) (10 points)

5. P4.6 (First-Order RC Circuits) (10 points)

6. P4.17 (First-Order RC Circuits). (16 points)
   f) Also find an expression for the energy stored in capacitor 2, as a function of time. (3 points)
   g) Find an expression for the power dissipated as a function of time by the resistor. (3 points)

7. (First order RL circuits). The circuit is at steady state at t<0. The output V_0 of the circuit is given by $V_0(t) = 6-3*e^{-.35\,t}$ V when t>0. (15 points)
    a. Write the initial voltage (at t=0-) as a function of R1 and R2. (3 points)
    b. Write the steady state voltage (at t=∞) in terms of R1 and R2. (3 points)
    c. Write the time constant for t>0. (3 points)
    d. Determine the values L, R1, and R2. (6 points)



8. P4.27 (DC Steady State) (5 points)

9. (RL and RC Circuits with General Sources). Consider a voltage source Vs across an inductor L and a resistor R. Write the differential equation for i(t), and find the complete solution if V_s=15cos(150*t). (15 points)