## Homework #0

Assigned 3/31/2014, due 1/4/2014

- **1.** Problem 1.24 in Jaeger and Blalock (4<sup>th</sup> Edition).
- 2. Problem 1.29 in J&B.
- **3.** Problem 1.57 in J&B.

**4.** Consider the circuits below. Assume that all capacitors and inductors are completely discharged until the switches are closed at t = 0 seconds, and that the input (voltage or current) is an ideal step function. Plot the current and voltage for all four circuits as a function of time from t = 0 to t = 10 seconds. Hint: recall the fundamental device relationships:

$$I = C\frac{dv}{dt} \qquad \qquad V = L\frac{dt}{dt}$$







**5.** Consider the circuit shown to the right. The voltage source which drives the circuit is  $V_0 = v_{dc}$  = 15 u(t) V.  $R_0$  = 1000  $\Omega$ ,  $R_1$  = 250  $\Omega$ ,  $L_0$  = 50 mH, and  $C_0$  = 1 µF. The output is the voltage across the capacitor,  $v_0$ .



- a) Calculate the transient response by applying the transfer function approach. Calculate the numerical expression for the transfer function, and the associated poles and zeros. Calculate and sketch the corresponding impulse response and the response to input  $v_{dc}$ .
- b) In order to verify your result, please build model in Multisim (circuit design software), or any other circuit modeling software you prefer (for example, Cadence PSpice). Please provide the simulation results, and check whether the results you obtain are the same as what you get in part a).
- **6.** Consider that we add one more source which is  $V_0 = v_{ac} = 5 \cos(10^6 t + 30^\circ) u(t)$  V as shown to below.  $V_1 = v_{dc} = 15 u(t)$  V.
  - a) Calculate the steady-state output using superposition.
  - b) Use circuit design software and check whether the result you obtain is same as what you get in part a)



7. Briefly answer the following:

## Q: Why are you taking EE 331 this quarter?