Linear Systems I  
EE 321/521  
Project NO I

For the electrical circuit shown in Figure 1, the switch has been closed for a long time before opening at $t = 0$. Assume that $x(t) = 80$ volts is the input, output $y(t)$ is the current $i_C$ passing through the capacitor $C$, $R_1 = 25K\Omega$, $R_2 = 60K\Omega$, $R_3 = 20K\Omega$, $L = 2mH$ and $C = 1\mu F$. Find

1. The initial conditions.
2. Transform the circuit shown in figure 1 to the s-domain.
3. Find the transfer function $H(s)$.
4. Find the output $Y(s)$ due to initial conditions (i.e. $x(t) = 0$).
5. Find $y_{IC}(t)$ due to initial conditions. Plot the response by hand and by using MATLAB.
6. Find $y_I(t)$ if $x(t) = 80u(t)$ and the initial conditions are zero. Also, plot the response by hand and by MATLAB.
7. Find the total response $y(t)$, i.e., find the response due to the input and the initial conditions. Also, plot the response by hand and by MATLAB.
8. Use the MATLAB command `pzmap` to plot the poles and zeros of the transfer function obtained in part 3.