ECE 461/661 - Test #1: Name _____
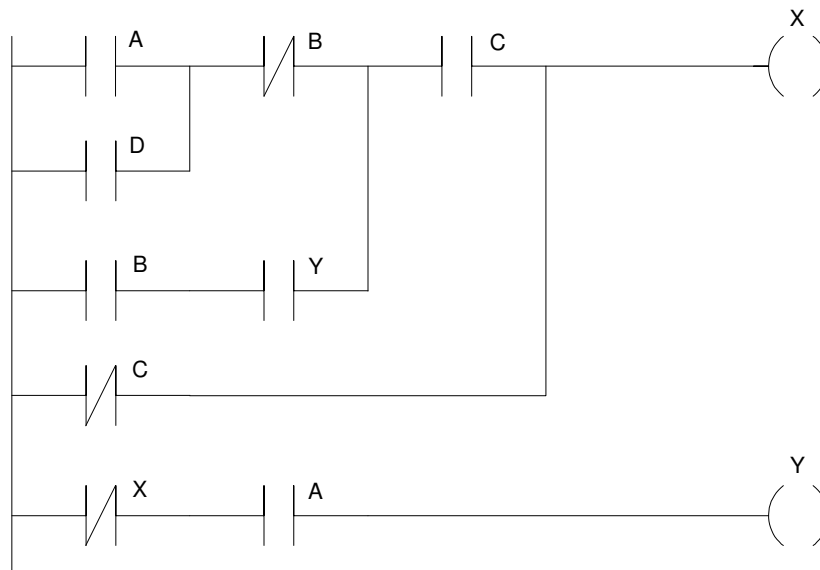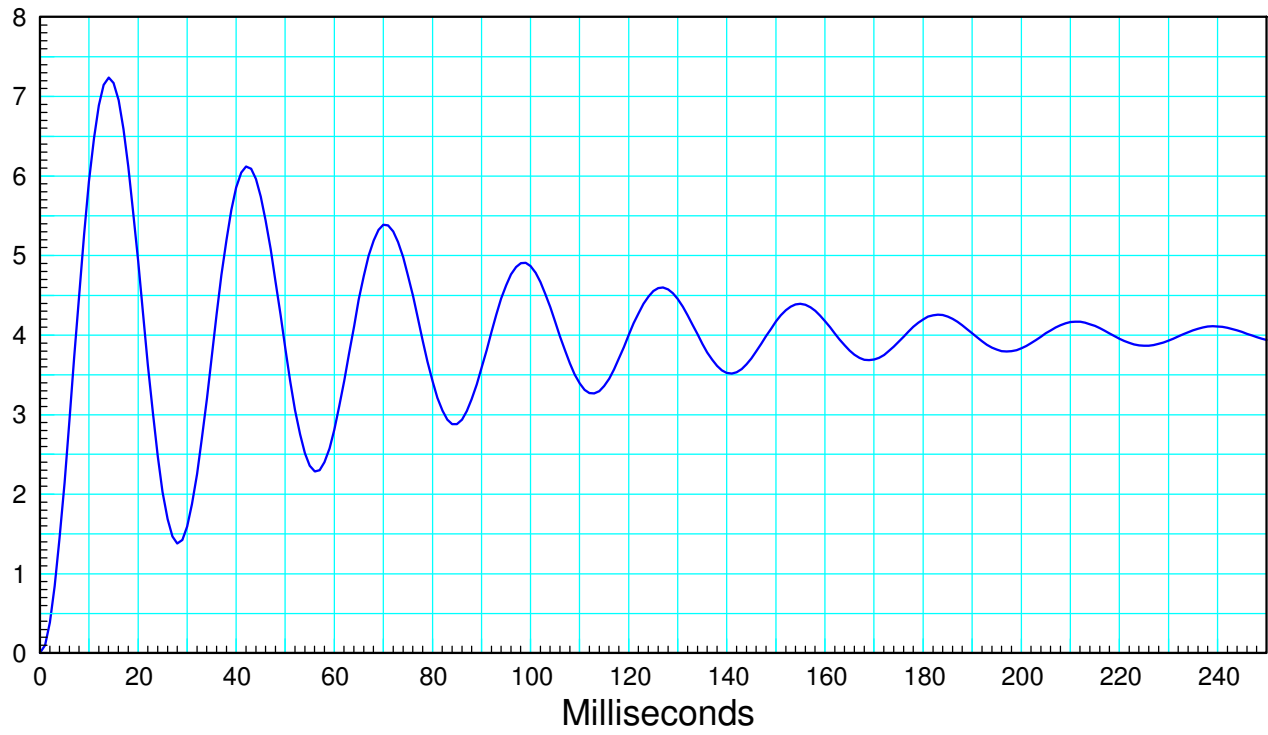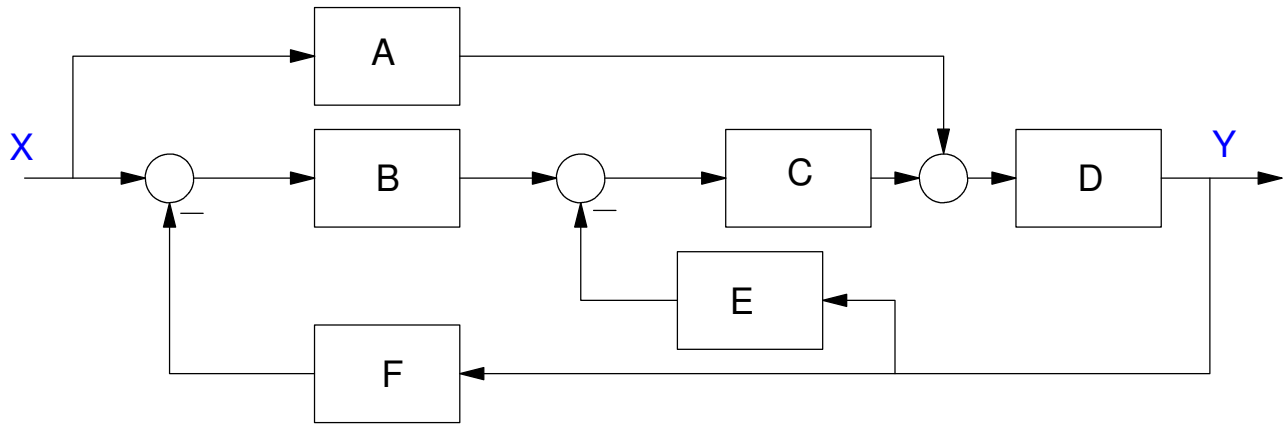
1) Determine the functions for X and Y according to the following ladder diagram.   (you don't need to simplify)

2) Give the transfer function for a system with the following response to a unit step input:
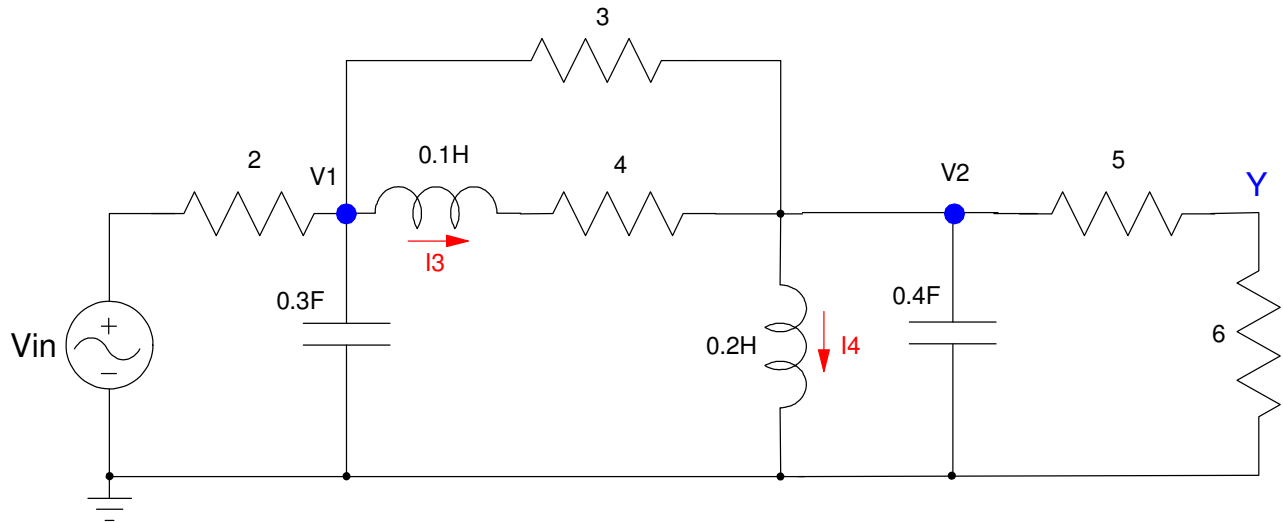

Milliseconds

3) Find the transfer funciton from X to Y

4) For the following RLC circuit:
   - Write the dynamics of this system as four compled differential equations in terms of {Vin, V1, V2, I3, I4}
   - You don't need to solve or put in state-space form (that's a different problem on the test)

5) Assume the dynamics of an RLC circuit are:

$$0.1sV_1 = \left(\frac{V_{in}-V_1}{2}\right) + \left(\frac{V_2-V_1}{3}\right)$$

$$0.2sV_2 = \left(\frac{V_1-V_2}{4}\right) - 2I_3$$

$$0.5sI_3 = V_1 - 2V_2 - 3I_3$$

$$Y = 4V_2 - 5I_3$$

- Give the state-space representation for the dynamics.

$$s\begin{bmatrix} V_1 \\ V_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} \underline{} & \underline{} & \underline{} \\ \underline{} & \underline{} & \underline{} \\ \underline{} & \underline{} & \underline{} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ I_3 \end{bmatrix} + \begin{bmatrix} \underline{} \\ \underline{} \\ \underline{} \end{bmatrix} V_{in}$$

$$Y = \begin{bmatrix} \underline{} & \underline{} & \underline{} \end{bmatrix} \begin{bmatrix} V_1 \\ V_2 \\ I_3 \end{bmatrix} + [\underline{}]V_{in}$$