ECE 351 - Lab 5 Prelab

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Tasks

Task 1

$$\frac{V_{in}(s) - V_{out}(s)}{R} = sCV_{out}(s) + \frac{1}{sL}V_{out}(s)$$

$$V_{in}(s)(\frac{1}{R}) = V_{out}(s)(\frac{1}{R} + sC + \frac{1}{sL})$$

$$H(s) = \frac{V_{out}(s)}{V_{in}(s)} = \frac{\frac{1}{R}}{\frac{1}{R} + sC + \frac{1}{sL}} = \frac{\frac{s}{R}}{\frac{s}{R} + s^2C + \frac{1}{L}} = \frac{\frac{1}{RC}s}{s^2 + \frac{1}{RC}s + \frac{1}{LC}}$$

Task 2

$$h(t) = L^{-1}\{H(s)\} = L^{-1}\{\frac{\frac{1}{RC}s}{s^2 + \frac{1}{RC}s + \frac{1}{LC}}\}$$

$$\rho = -\frac{1}{2RC} + \frac{1}{2}\sqrt{(\frac{1}{RC})^2 - 4 * \frac{1}{LC}}$$

$$g = \frac{1}{RC}s|_{s=\rho}$$

$$R = 1k\Omega, L = 27mH, C = 100nF$$

$$\rho = -5000 + j18585, g = 19.25\angle 105^\circ$$

$$y_s(t) = \frac{|g|}{\omega}e^{\alpha t}sin(\omega t + \angle g)u(t)$$

$$h(t) = y_s(t) = \frac{19.25}{18525}e^{-5000t}sin(18585t + 105^\circ)u(t) = 0.001036e^{-5000t}sin(18585t + 105^\circ)u(t)$$