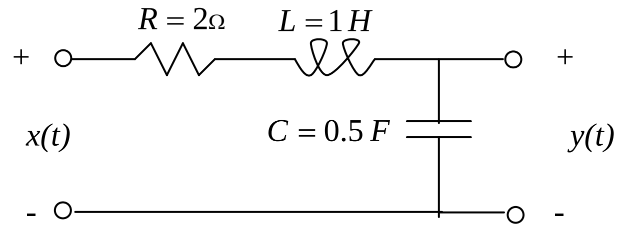
Assignment #08

ECSE-2410 Signals & Systems - Spring 2011 Due Tue 02/22/11

1(80). Consider the RLC circuit shown,



(a)(5). Find $H(s)$.

(b)(5). Find the input-output differential equation for this circuit.

(c)(10). Use Simulink to implement the differential equation with summer and integrator blocks (no overall single large transfer function). Use format pull-down menu to figure out how to flip a block so that the input in on the right and the output is on the left.

(d)(5). Is the system overdamped, critically damped, underdamped or undamped? Justify your answer. Sketch the pole-zero plot.

(e)(10). Find the impulse response, $h(t)$.

(f)(10). Use Matlab to plot the impulse response equation you found in (e).

(g)(10). Use the Matlab command impulse(num,den) to plot the system impulse response and compare this plot to the one in (f). Do a ‘help impulse’ for more information.

(h)(10). Find the analytical equation for the system **step** response.

(i)(10). Use the Matlab symbolic toolbox to find the equation for the system step response. Compare this to your result in (h).

(j)(5). Use the Matlab command step(num,den) to plot the system step response. Do a ‘help step’ for more details.

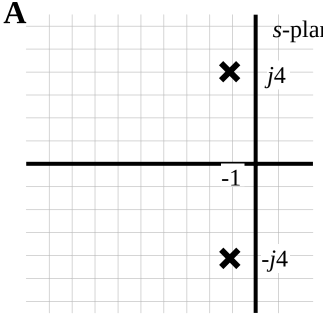
2(20). The following pole-zero diagrams represent the transfer function, $H(s)$ of four *different* systems. For *each case* find the

(a)(4) damping factor, ζ (b)(4) natural frequency, ω_n (c)(4) damped frequency, $\omega_d = \omega_n\sqrt{1-\zeta^2}$,

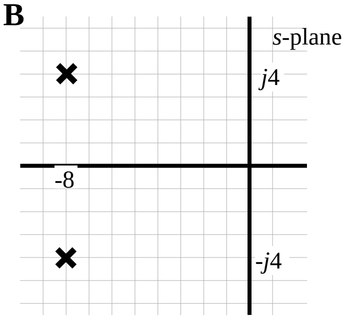
and answer the questions: for which system

(d)(4) (A,B,C,or D?) does the step response have the fastest rate of decay?
(e)(4) (A,B,C,or D?) does the step response have the highest damped frequency of oscillation?

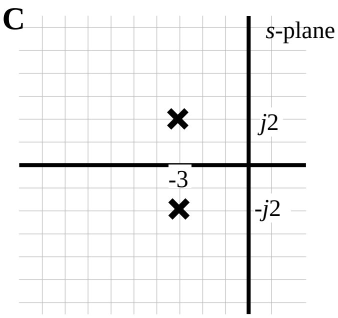
A



B



C



D