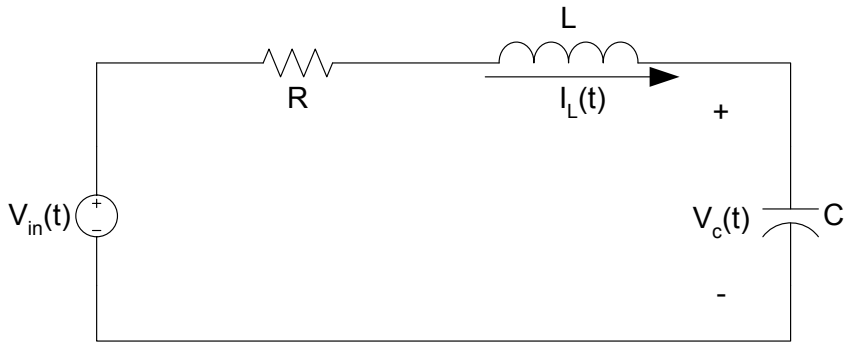
11-April-2015
ECE 232
Midterm

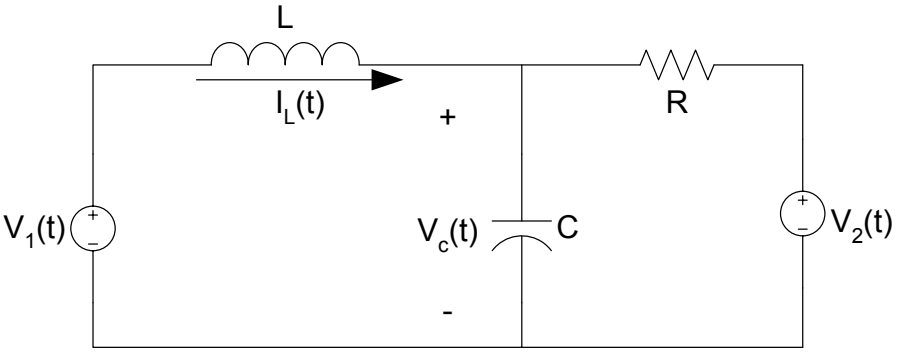
Q1) For the second order circuit below the resistance value R = 6 Ohm, the capacitance value C = 0.2 Farad and the inductance value L = 1 Henry.



For the following cases use Laplace transformation to find the results

a) Assume $V_{in}(t)$ = u(t) Volt (unit step function) when t>0 and the initial conditions for the capacitor voltage $V_C(0)$ = 0 Volt and inductor current $I_L(0)$ = 0 Ampere. Find $V_C(t)$ when t>0. **(15 point)**
b) Assume $V_{in}(t)$ = 0 Volt when t>0 and the initial conditions for the capacitor voltage $V_C(0)$ = 2 Volt and inductor current $I_L(0)$ = 0 Ampere. Find $V_C(t)$ when t>0. **(10 point)**

Q2) For the circuit second order circuit below the resistance value R = 1 Ohm, the capacitance value C = 0.5 Farad and the inductance value L = 2 Henry.



For the following cases use Phasor transformation to find the results:

a) Assume $V_1(t)$ = 2Cos(t) Volt and $V_2(t)$ = Sin(t) Volt when t>0. Find $V_C(t)$ and power dissipated over the resistor R when sinusoidal steady state conditions are reached. **(10 point)**
b) Assume $V_1(t)$ = Cos(t) Volt and $V_2(t)$ = Sin(2t) Volt when t>0. Find $V_C(t)$ and power dissipated over the resistor R when sinusoidal steady state conditions are reached. **(20 point)**

Q3) For the transfer function $H(s) = 5\frac{(s+10)}{(s+50)}$. **(25 point)**

a) Find the **magnitude** characteristics of the frequency response of H(jw).
(3 point)
b) Find the **phase** characteristics of the frequency response of H(jw).
(3 point)
c) Draw the approximate magnitude response in dB (decibel) in logarithmic scale. While obtaining the approximate magnitude response show all the approximations. In your plot show all the important points and details.
(9 point)
d) Draw the approximate phase response in degree in logarithmic scale. While obtaining the approximate phase response show all the approximations. In your plot show all the important points and details.
(10 point)

Q4) $H(s) = \frac{s^2 + 1600}{s^2 + 100s + 1600}$ is a **band-stop** filter. **(20 point)**

a) Find the **magnitude** characteristics of the frequency response of H(jw)
(3 point)
b) Find the **phase** characteristics of the frequency response of H(jw)
(3 point)
c) Find the angular frequency where magnitude response is minimized.
(2 point)
d) Find the damping ratio.
(2 point)
e) Find the corner frequencies.
(4 point)
f) Draw the magnitude response in linear scale. While obtaining the magnitude response show all the important points and details.
(3 point)
g) Draw the phase response linear scale. While obtaining the phase response show all the important points and details.
(3 point)