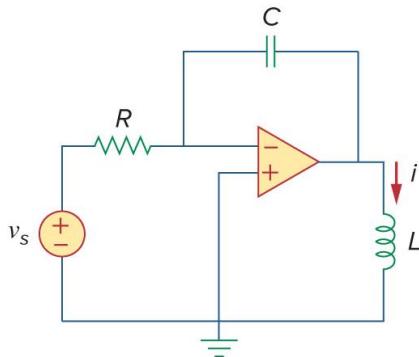


Quiz #5 [50pts] (20min) Name _____ ID _____

1. [6pts] If a sinusoidal input of $A \cos(\omega_i t)$ is applied to a circuit composed of resistors, inductors and capacitors with some initial energy, what are possible steady-state waveforms at any voltage or current? Choose all that applies. Assume that the circuit is configured so that current flows through every R,L and C.

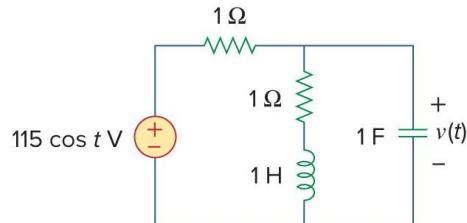
- 1) $A_1 \sin(\omega_i t + \phi)$
- 2) $A_1 \cos(\omega_i t + \phi_1) + e^{-ct} A_2 \cos(\omega_i t + \phi_2)$
- 3) $A_1 \cos(\omega_i t + \phi_1) + A_2 \cos(n\omega_i t + \phi_n)$, n : some integer > 1
- 4) $A_1 \cos(\omega_i t + \phi_1) + A_2 \cos(\omega_{LC} t + \phi_n)$, ω_{LC} : frequency generated by L and C.

2. [5pts] [8.63] What is the order of the below circuit when the output is $v_o(t)$? (i.e. 1st-order? 2nd-order? 3rd-order?)



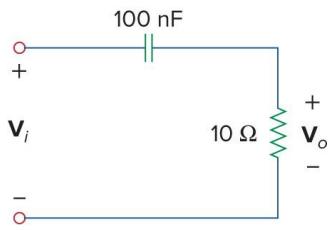
3. [11pts] [9.41] Please consider the circuit shown below.

- (a) Please represent $v(t)$ as \mathbf{V} , where $\mathbf{V} = a + bj$. Please calculate the numeric values for a and b. [6pts]



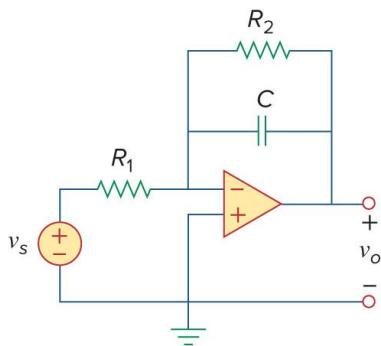
- (b) Suppose $\mathbf{V} = a + bj$. What is $v(t)$ in time domain? Please use a and b to express your answer. [5pts]

4. [6pts] [9.77] What is the phase shift of the below circuit at 2MHz?



5. [12pts] Consider the circuit shown below.

- (a) Please draw an equivalent circuit without using an opamp so that $|v_o/v_s|$ are the same. You may use independent sources. [8pts]



- (b) What is the purpose of this circuit? [4pts] (-2pts if incorrect)

- 1) Low-pass filter 2) High-pass filter 3) Notch-filter 4) Band-pass filter

6. [10pts] [10.21] Find V_o/V_i for $\omega=0$ (3pts) and $\omega = \infty$ (3pts) and $\omega = 1/\sqrt{LC}$ (4pts). Express your answer using j, R, L and C .

