Quiz #4 [50pts]   Your name ________________ Your ID ______________

1. [8pts] Suppose there is a second-order circuit which consists of resistors, capacitors and inductors. A differential equation that describes the voltage of a node can be described as :

$$\frac{d^2x(t)}{dt^2}+2\alpha\frac{dx(t)}{dt}+\omega_0{}^2x(t)=0$$

Select all that is true about alpha. [4pts deducted for every wrong answer you choose]

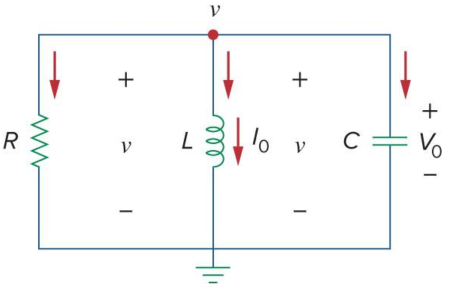
(a) α must be real

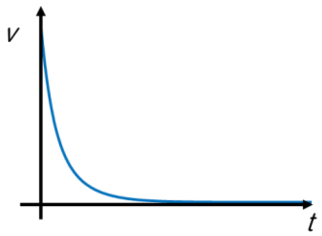
(b) α must be a positive value

(c) α can be a negative value

(d) α can be imaginary.

2. [10pts] Consider the below parallel RLC circuit, which has the below natural response. In order to have underdamped response, how will you change the resistance?





(a) Increase R

(b) Decrease R

(c) Changing R won't affect the response

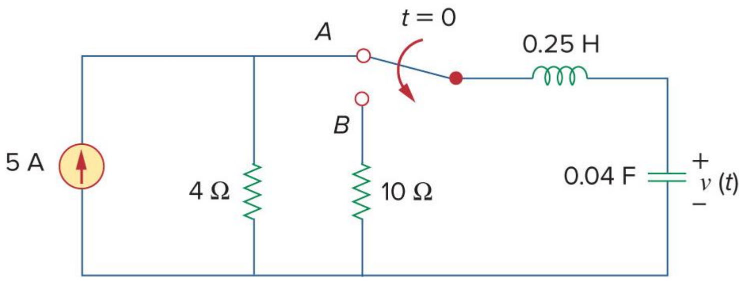
What is your confidence level in your answer above? Please circle. (Your points = confidence level x 5 if correct)

0 (Wild guess)   0.5 (Not sure)   1 (Somewhat confident)   1.5 (Confident)   2 (Absolutely certain)

3. [8.11] [10pts] The natural response of an RLC circuit is described by the following differential equation

$\dfrac{d^2v(t)}{dt^2}+2\dfrac{dv(t)}{dt}+v(t)=0$, for which the initial conditions are v(0) = 10V and dv(0)/dt = 0. **Solve for *v(t)*.**

4. [8.17] [15pts] Consider the circuit shown below



(a) [5pts] What kind of response does *v(t)* have for t>0?

1) Overdamped response
2) Underdamped response
3) Critically damped response

(b) [5pts] Write down a solution for *v(t)* for t>0. You may have up to two unknown variables in your solution.

(c) [5pts] What is *v(0)* ?

5. [7pts] [8.27] A voltage in an RLC circuit is described by $\frac{d^2v(t)}{dt^2}+4\frac{dv(t)}{dt}+8v(t)=24$.

Find *v(t)* as t $\rightarrow \infty$.