Examination Rules

1. All books, notes, and personal items (with the exception of pencils, eraser, calculator, TEN sheets of unmarked scratch paper, and ladies' purses) must be left in the back of the room.

2. The examination is Closed Book, Closed Note, and Closed Reference.

3. Answers must be placed in the indicated space for a problem to be eligible for grading.

4. The examination must be submitted to the examination proctor prior to 8:30 p.m. to be graded.

5. Academic misconduct (i.e. plagiarism or cheating) will not be tolerated. Any suspected instance of academic misconduct will be investigated thoroughly. Any student involved in academic misconduct will be prosecuted to the full extent allowed under university policy. This penalty will include an automatic grade of "F" in the course without the opportunity for withdrawal. If the offense is the second offense at UAB, permanent dismissal from UAB will result.

6. No student may leave their seat without the permission of the examination proctor unless in the process of submitting the examination for grading and leaving the room.

I have read an understand the above stated examination rules.

________________________________________________________________________

Signature

________________________________________________________________________

PRINTED NAME (FIRST, M.I., LAST)    STUDENT NUMBER
1. [20 points] Find the transfer function, \( H(s) = \frac{V_0(s)}{V_i(s)} \) for the following circuit.

\[
\frac{V_0(\omega)}{V_i(\omega)} = \frac{L^2}{RLC\omega^2 + L\omega + R}
\]

2. [10 points] Find the indicated function for \( t > 0 \) for the following circuit.

\[
i_o(t) = 5 \text{ mA}
\]

3. [10 points] Find the indicated function for \( t > 0 \) for the following circuit.

\[
V_o(t) = 6e^{-t/0.15 \text{ sec}} \text{ V}
\]

4. [10 points] Find the indicated function for \( t > 0 \) for the following circuit.

\[
V_o(t) = -6e^{-t/0.25 \text{ sec}} \text{ V}
\]
5. [50 points total] For \( v(t) \) in the following circuit:

\[
\frac{d^2}{dt^2} v(t) + \left(\frac{1}{RC}\right) \frac{dv}{dt} v(t) + \left(\frac{1}{LC}\right) v(t) = \left(\frac{8}{LC}\right)
\]

[10 points] Write the differential equation:

\[
2^2 + 6 \alpha + 5 = 0
\]

[5 points] The roots of the characteristic equation are:

\[
\alpha = -1, \quad \alpha = -5
\]

[5 points] This system is \( \text{Overdamped} \) \( \checkmark \) Critically-Damped ___ Underdamped ___

[5 points] \( v(t) \) at \( t = 0^+ \) is:

\[
v(t) = 0
\]

[5 points] \( v(t) \) at \( t = +\infty \) is:

\[
v(t) = 8 \text{V}
\]

[5 points] \( \frac{dv}{dt} \) at \( t = 0^+ \) is:

\[
\frac{dv}{dt} = \frac{20}{3} \text{V sec}^{-1}
\]

[10 points] For \( t > 0 \),

\[
v(t) = \frac{-25}{3} e^{-t} + \frac{1}{3} e^{-5t} + 8 \text{V}
\]

[5 pts] Bonus: Spark: \( \text{NO} \)