EE2210 Electric Circuits Fall 2023

Quiz 4 (Total 100 points)

It is a closed-book, closed-note quiz. Cheating leads to 0% score.

Calculator is allowed. Please show the process of thinking/calculation. Indicate your final answers clearly. Unit is needed if applicable.

1. In Figure 1, a constant voltage source of 10 V is applied at t = 0 (which means no voltage applied to the circuit at t < 0). Given that $i_1(0^-) = 2$ A and $v_4(0^-) = 4$ V. Find all branch voltages (v_1 to v_4) and current (i_1 to i_4) at t = 0^+ and t = ∞. (20%, each 2.5%)

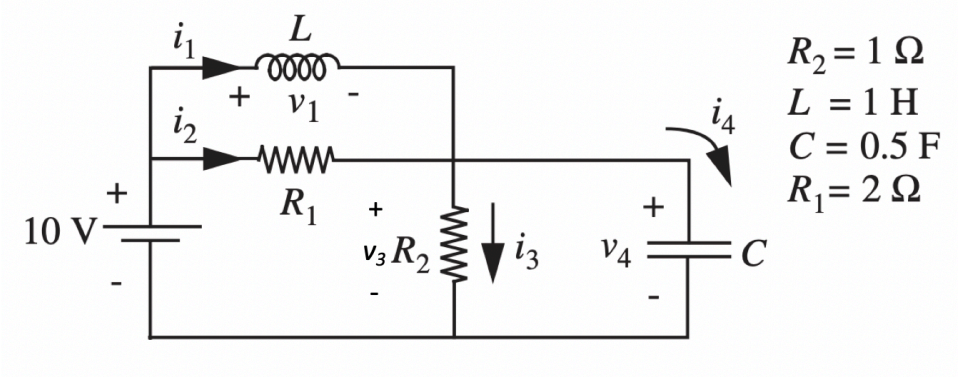

Figure 1.

2. Consider the circuit in Figure 2. Assume the operational amplifier is ideal. Derive the second-order differential equation that shows how the voltage $v_2(t)$ is related to the input voltage $v_S(t)$. (20%)

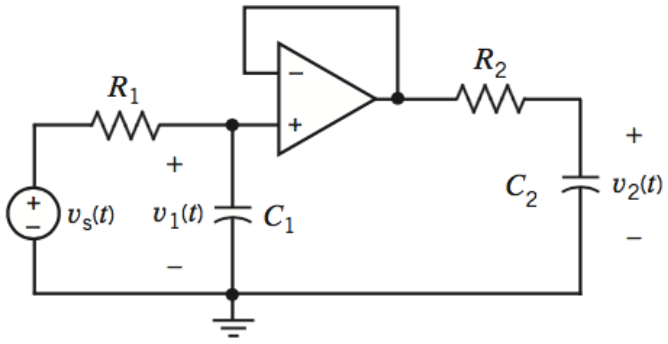

Figure 2.

3. Consider the circuit in Figure 3. Given $v_C(0^-) = 0$ V and $i_L(0^-) = 0$ A. i_L is the inductor current. Find $v_C(t)$ for $t \geq 0$. (30%)

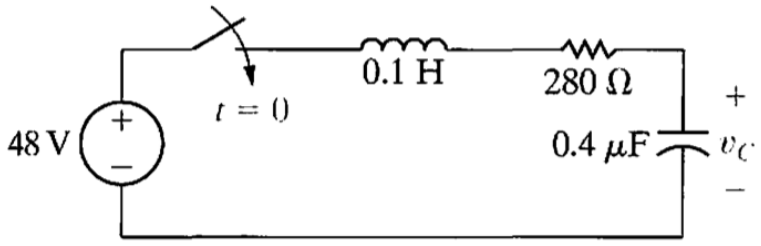

Figure 3.

4. Consider the circuit in Figure 4. $v(0^+) = 12$ V and $i_L(0^+) = 30$ mA. Find $v(t)$ for $t \geq 0$. (30%)

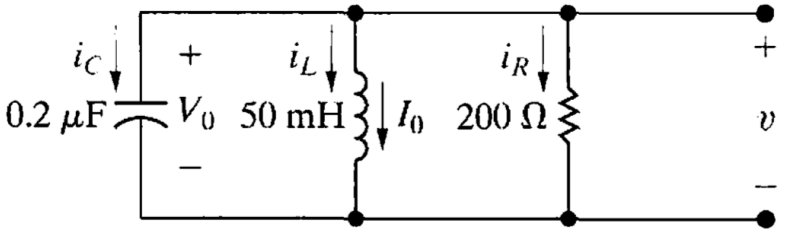

Figure 4.