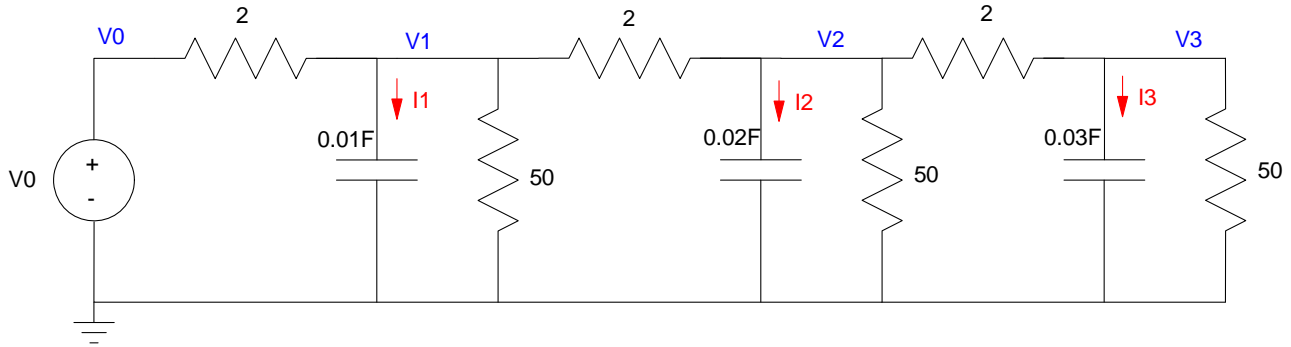


ECE 311 - Homework #18

State variable Solution

Problem 1 -3) For the following circuit



Problem 1: Assume

- $V_0 = 0V$
- $v_1(0) = v_2(0) = v_3(0) = 10V$.

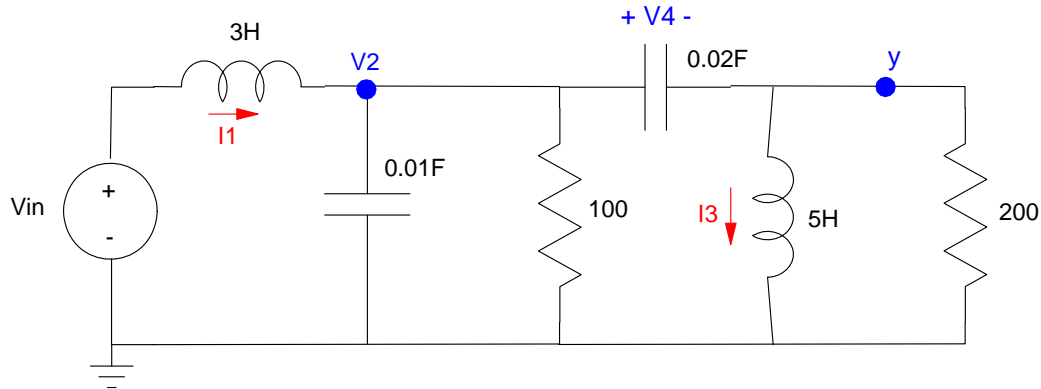
Find the voltage at $v_3(t)$.

- Express the dynamics in state-variable form.
- Place in matrix (state-variable) form
- Find the transfer function from V_0 to V_3

Problem 2: Assume $V_3(t) = 10V$. What initial condition makes the voltages decay

- As slow as possible?
- As fast as possible?

Problem 3-5: Assume $v_{in}(t) = 0$.



Problem 3: Assume

- $i_1(0) = i_3(0) = 2\text{A}$.
- $v_2(0) = v_4(0) = 10\text{V}$.

i) Write the dynamics for this system (i.e. the voltage node equations using LaPlace notation)

ii) Place in matrix form.

iii) Find $y(t)$ (matlab plot is OK)

Problem 4: Assume $v_4(0) = 10$.

- What initial conditions on $i_1(0)$, $v_2(0)$, and $i_3(0)$ result in $v_4(t)$ decaying as slow as possible?
- Find $y(t)$ for these initial conditions.

Problem 5: Assume $v_4(0) = 10$.

- What initial conditions on $i_1(0)$, $v_2(0)$, and $i_3(0)$ result in $v_4(t)$ decaying as fast as possible?
- Find $v_4(t)$ for these initial conditions.