Electrical Engineering

HW 4 – Chapter 5

<1>

5.23 Determine the current i_C through the capacitor just before and just after the switch is closed in Figure P5.23. Assume steady-state conditions for $t < 0$. $V_1 = 15\,\text{V}$, $R_1 = 0.5\,\text{k}\Omega$, $R_2 = 2\,\text{k}\Omega$, and $C = 0.4\,\mu\text{F}$.

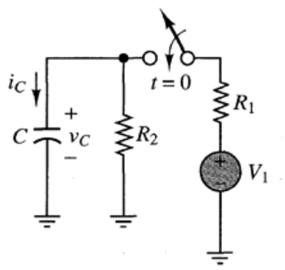

Figure P5.23

<2>

5.32 Determine the voltage v_C across the capacitor shown in Figure P5.32 for $t > 0$. The voltage across the capacitor just before the switch is thrown is $v_C(0^-) = -7\,\text{V}$. Assume:

$I_o = 17\,\text{mA}$ $\quad C = 0.55\,\mu\text{F}$

$R_1 = 7\,\text{k}\Omega$ $\quad R_2 = 3.3\,\text{k}\Omega$

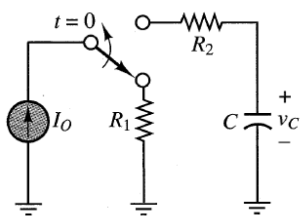

Figure P5.32

(Hint: the source is current source not voltage source)

<3>

5.33 For $t < 0$, the circuit shown in Figure P5.29 is at steady state. The switch is thrown at $t = 0$. Determine the current i_L through the inductor for $t > 0$. Assume:

$V_{S1} = 9\,\text{V}$ $\quad V_{S2} = 12\,\text{V}$

$L = 120\,\text{mH}$ $\quad R_1 = 2.2\,\Omega$

$R_2 = 4.7\,\Omega$ $\quad R_3 = 18\,\text{k}\Omega$

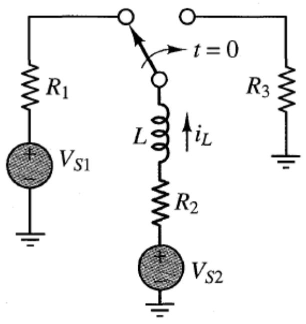

Figure P5.29

<4>

5.37 Determine the current i_C through the capacitor in Figure P5.37 for all time. Assume DC steady-state conditions for $t < 0$. Also assume: $V_1 = 10\,\text{V}$, $C = 200\,\mu\text{F}$, $R_1 = 300\,\text{m}\Omega$, and $R_2 = R_3 = 1.2\,\text{k}\Omega$.

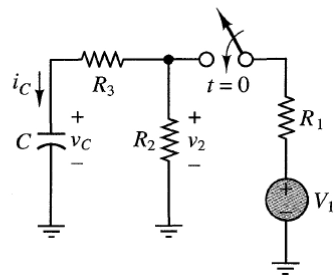

Figure P5.37

<5>

5.61 In the circuit shown in Figure P5.61:

$V_{S1} = 15\,\text{V}$ $\quad V_{S2} = 9\,\text{V}$

$R_{S1} = 130\,\Omega$ $\quad R_{S2} = 290\,\Omega$

$R_1 = 1.1\,\text{k}\Omega$ $\quad R_2 = 700\,\Omega$

$L = 17\,\text{mH}$ $\quad C = 0.35\,\mu\text{F}$

Assume that DC steady-state conditions exist for $t < 0$. Determine the voltage v_C across the capacitor and the current i_L through the inductor as $t \to \infty$.

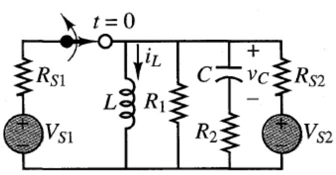

Figure P5.61

Problem <6>~<8> are regarding the second order system. Some circuits change their connections when t>0 (so you may be confused when you derive a differential equation). When you derive a second-order differential equation, consider the circuit only for t>0. The circuit condition for t<0 is only used to calculate the initial condition of the circuit.

<6>

5.75 Determine i_L for $t > 0$ in Figure P5.75, assuming $i(0) = 2.5$ A and $v_C(0) = 10$ V.

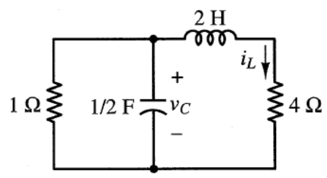

Figure P5.75

<7>

5.76 Find the maximum value of v_C for $t > 0$ in Figure P5.76, assuming DC steady state at $t = 0^-$.

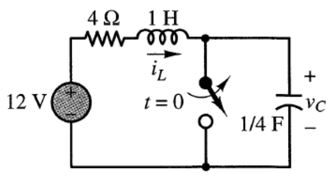

Figure P5.76

<8>

5.82 For $t > 0$, determine v in Figure P5.82, assuming DC steady state at $t = 0^-$.

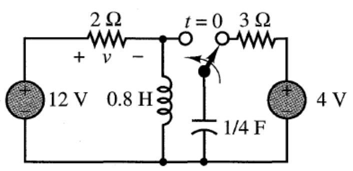

Figure P5.82