HOMEWORK SET 8

Issued: October 25, 2004 Due: November 1, 2004

Problem 1. Do Problem 5.23.

Problem 2. Do Problem 5.26.

Problem 3. Do Problem 5.34.

Problem 4. Do Problem 5.35.

Problem 5. Do Problem 5.41.

5.23 Determine the current through the capacitor just before and just after the switch is closed in Figure P5.23. Assume steady-state conditions for $t < 0$.

$V_1 = 12$ V $\quad C = 0.5\ \mu$F

$R_1 = 0.68$ kΩ $\quad R_2 = 1.8$ kΩ

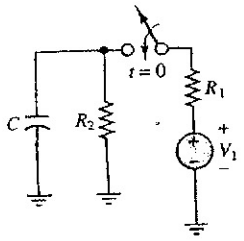


Figure P5.23

5.34 Assume DC steady-state conditions exist in the circuit shown in Figure P5.34 for $t < 0$. The switch is changed at $t = 0$ as shown.

$V_{S1} = 17$ V $\quad V_{S2} = 11$ V

$R_1 = 14$ kΩ $\quad R_2 = 13$ kΩ

$R_3 = 14$ kΩ $\quad C = 70$ nF

Determine

a. $v(t)$ for $t > 0$

b. The time required, after the switch is operated, for $V(t)$ to change by 98 percent of its total change in voltage

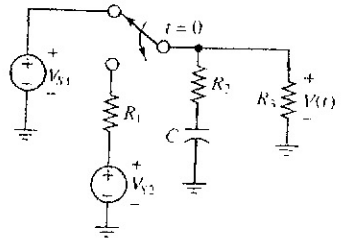


Figure P5.34

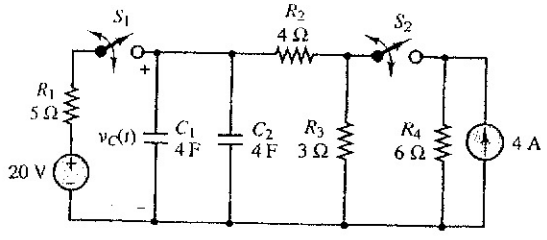
5.41 For the circuit shown in Figure P5.41, assume that switch S_1 is always open and that switch S_2 closes at $t = 0$.

a. Find the capacitor voltage $v_C(t)$ at $t = 0^+$.

b. Find the time constant τ for $t \geq 0$.

c. Find an expression for $v_C(t)$, and sketch the function.

d. Find $v_C(t)$ for each of the following values of t: $0, \tau, 2\tau, 5\tau, 10\tau$.



5.26 Determine the voltage across the inductor just before and just after the switch is changed in Figure P5.26. Assume steady-state conditions exist for $t < 0$.

$V_S = 12$ V $\quad R_s = 0.7\ \Omega$

$R_1 = 22$ kΩ $\quad L = 100$ mH

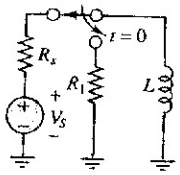


Figure P5.26

5.35 The circuit of Figure P5.35 is a simple model of an automotive ignition system. The switch models the "points" that switch electric power to the cylinder when the fuel-air mixture is compressed. And R is the resistance between the electrodes (i.e., the "gap") of the spark plug.

$V_G = 12$ V $\quad R_G = 0.37\ \Omega$

$R = 1.7$ kΩ

Determine the value of L and R_1 so that the voltage across the spark plug gap just after the switch is changed is 23 kV and so that this voltage will change exponentially with a time constant $\tau = 13$ ms.

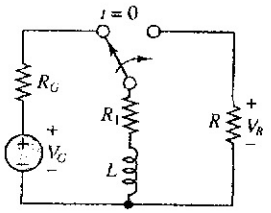


Figure P5.35