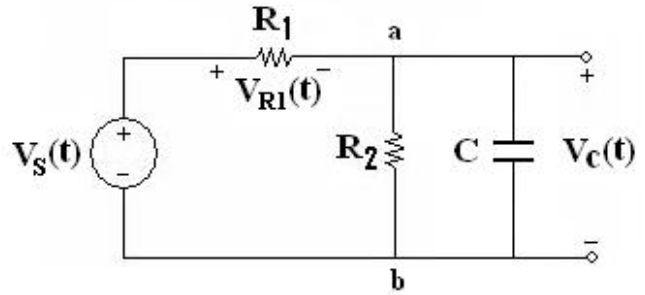
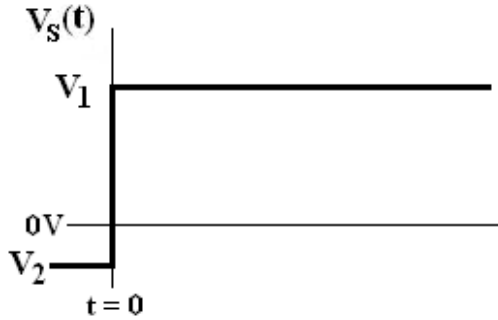


JEE2330 – Spring 2025

Lab #2A Problem

In the laboratory, you are to construct an RC circuit similar to the one shown below. In this circuit, assume that $R_1 = 15 \text{ k}\Omega$, $R_2 = 20 \text{ k}\Omega$, $C = 0.03 \text{ }\mu\text{F}$, and the source voltage $v_s(t)$ is shown on the left as a step change from $V_2 = -3\text{V}$ to $V_1 = 7\text{V}$ at $t = 0$. In the steps below, you are asked to determine the voltage across the capacitor.



1. Redraw the circuit using the Thevenin equivalent circuit that is seen by the capacitor at terminals a and b.

$$V_T = \underline{\hspace{2cm}}$$

$$R_T = \underline{\hspace{2cm}}$$

2. Assuming that $v_s(t) = V_2$ for a long period of time ($> 10 \tau$) prior to $t = 0$, what is the initial value of the capacitor voltage at $t = 0$?

$$v_C(0) = \underline{\hspace{2cm}}$$

3. What is the final value of the capacitor voltage?

$$v_C(\infty) = \underline{\hspace{2cm}}$$

4. What is the time constant for this circuit?

$$\tau = \underline{\hspace{2cm}}$$

5. Write the equation for $v_C(t)$ for $t > 0$, fill in the table below, and accurately sketch the waveform for $v_C(t)$.

| t (μsec) | $v_C(t)$ (volts) |
|-------------------------|------------------|
| 0 | |
| 200 | |
| 400 | |
| 600 | |
| 800 | |
| 1000 | |