Capacitor Charging (37:51)

Draw the general purpose plot of current through a capacitor as a function of time for a simple capacitor charging process and identify an equation that describes this phenomenon.

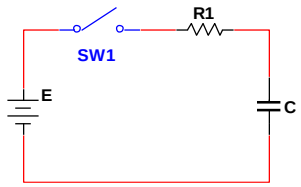
Draw the general purpose plot of voltage across a capacitor as a function of time for a simple capacitor charging process and identify an equation that describes this phenomenon.

Identify the model used to describe an uncharged capacitor at the beginning of the charge process.

Identify the model used to describe a fully charged capacitor at the end of the charge process.

Identify the formula used to calculate the time constant, τ, for a simple capacitor charging circuit.

Capacitor Charging Circuit 1 (5:10 to 17:50)



E = 12V
R_1 = 200Ω
C = 15µF

Determine the time constant for capacitor charging circuit 1. Determine the time necessary for a full charge.

Determine the initial values for V_C and I_C for capacitor charging circuit 1. Assume the capacitor is initially uncharged.

Determine the final values for V_C and I_C for capacitor charging circuit 1.

Derive the time variant expressions for $i_c(t)$ and $v_c(t)$ and plot these properties for a full charge.

Determine the instantaneous values of I_C and V_C at t=2ms.

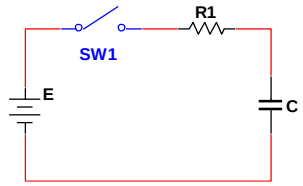
Determine the time I_C has dropped to 10mA.

Determine the time V_C has risen to 10V.

Derive the time variant expressions for $i_R(t)$ and $v_R(t)$ and plot these properties for a full charge.

Determine the instantaneous values of I_R and V_R at t=0, 2ms, 5.4ms, and 15ms.

Capacitor Charging Circuit 2 (17:50 to 25:21)



E = 24V
R_1 = 500Ω
C = 47µF

Determine the time constant for capacitor charging circuit 2. Determine the time necessary for a full charge.

Determine the initial values for V_C and I_C for capacitor charging circuit 2. Assume the capacitor is initially uncharged.

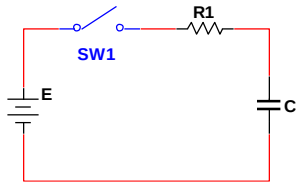
Determine the final values for V_C and I_C for capacitor charging circuit 2.

Derive the time variant expressions for $i_c(t)$, $v_c(t)$, $i_R(t)$, and $v_R(t)$, and plot these properties for a full charge.

Determine the instantaneous values of I_C , V_C, V_R, and I_R at t=20ms.

Determine the time V_C has risen to 15V. At this same time determine the instantaneous values of I_C, V_R, and I_R.

Capacitor Charging Circuit 3 (25:21 to 31:00)



E = 8V
R_1 = 250Ω
C = 2µF

Determine the time constant for capacitor charging circuit 3. Determine the time necessary for a full charge.

Determine the initial values for V_C and I_C for capacitor charging circuit 3. Assume the capacitor is initially uncharged.

Determine the final values for V_C and I_C for capacitor charging circuit 3.

Derive the time variant expressions for $i_c(t)$, $v_c(t)$, $i_R(t)$, and $v_R(t)$, and plot these properties for a full charge.

Determine the instantaneous values of I_C, V_C, V_R, and I_R at t=700µs.

Determine the time V_C has risen to 5.2V. At this same time determine the instantaneous values of I_C, V_R, and I_R.