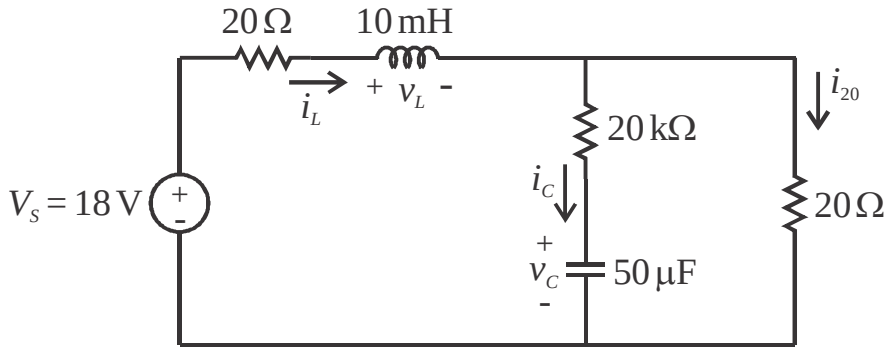
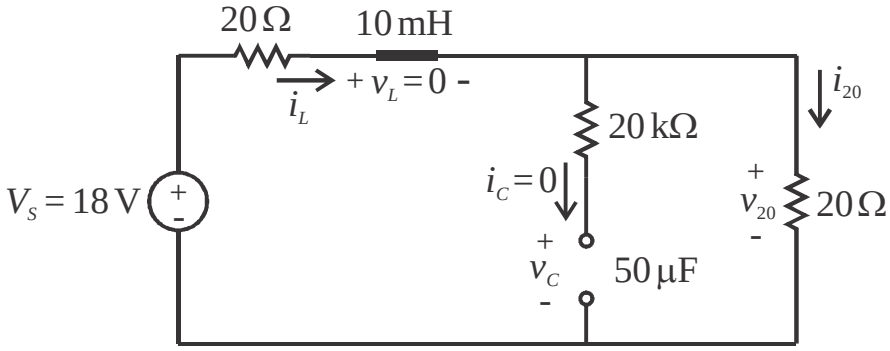
Example- For the DC circuit at steady-state, find the currents, voltages, and stored energy for the capacitor and inductor.



- At steady-state nothing is changing with time, therefore-

$$v_L = L\frac{di_L}{dt} \quad \Rightarrow \quad \underline{v_L = 0} \text{ (short)} \quad \text{and} \quad i_C = C\frac{dv_C}{dt} \quad \Rightarrow \quad \underline{i_C = 0} \text{ (open)}$$

- With this information the circuit becomes-



- Since there is no current through the capacitor, the voltage source, inductor and the two 20 Ω resistors are all in series. Hence-

$$i_L = i_{20} = \frac{V_S}{20+20} = \frac{18}{20+20} \Rightarrow \underline{i_L = i_{20} = 0.45 \text{ A}}$$

$$v_{20} = V_S\left(\frac{20}{20+20}\right) = 18(0.5) = 9 \text{ V}$$

- By KVL around the right hand loop (note there is no voltage drop across 20 kΩ resistor since $i_C = 0$)-

$$-v_C + 0(20 \text{ k}\Omega) + v_{20} = 0 \quad \Rightarrow \quad \underline{v_C = v_{20} = 9 \text{ V}}$$

- Finally, we can now calculate the stored energies-

$$w_L = 0.5Li_L^2 = 0.5(10 \bullet 10^{-3})0.45^2 \quad \Rightarrow \quad \underline{w_L = 1.0125 \text{ mJ}}$$

$$w_C = 0.5Cv_C^2 = 0.5(50 \bullet 10^{-6})9^2 \quad \Rightarrow \quad \underline{w_C = 2.025 \text{ mJ}}$$