ECE 1250 homework # 8

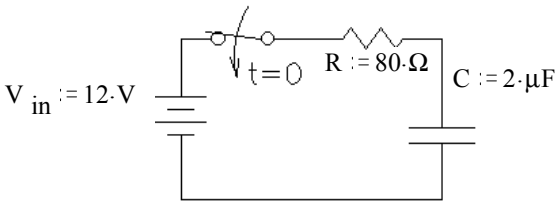
A.Stolp a

1. A 10-microfarad capacitor has been charged to a potential of 150 volts. A resistor of 25 Ω is then connected across the capacitor through a switch. When the switch has been closed for 10 time constants the total energy dissipated by the resistor is most nearly:

   (A) 1.0×10^{-7} joules (B) 1.1×10^{-1} joules (C) 9.0×10^{1} joules (D) 9.0×10^{3} joules

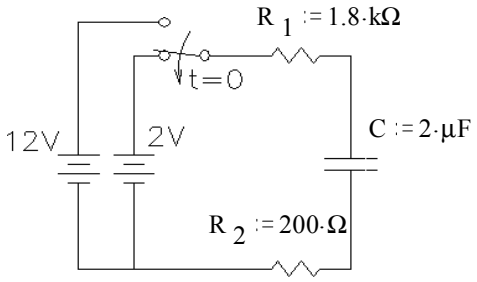
2. a) The switch is closed at time $t = 0$ and $v_C(0) = 0V$, find $v_C(t)$.

   b) What is the value of the voltage across C at $t := 40 \cdot \mu s$



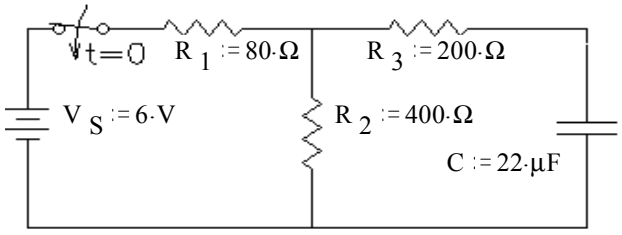
3. The switch below has been in the upper position for a long time and is switched down at time $t = 0$.

   At what time is $v_C = 4$ V?



4. a) What is the time constant of this circuit?
   Hint: Use a Thevenin equivalent circuit.

   b) What will be the final value of v_C?
   (After the switch has been closed for a long time)

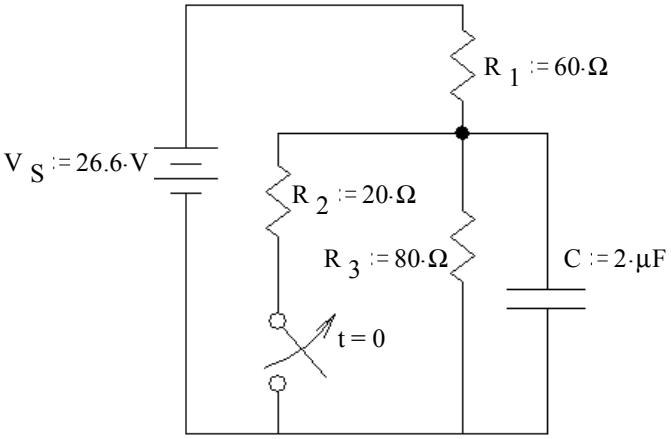


5. The switch has been closed (making contact) for a long time and is opened (as shown) at time $t = 0$.

   a) Find the complete expression for $v_C(t)$.

   b) Find v_C at time $t = 2\tau$.

   c) At time $t = 2\tau$ the switch is closed again. Find the complete expression for $v_C(t')$ where t' starts at $t = 2\tau$.



Answers 1. B 2.a) $12 \cdot V - 12 \cdot V \cdot e^{-\frac{t}{0.16 \cdot ms}}$ b) $2.65 \cdot V$ 3. $6.44 \cdot ms$ 4. a) $5.87 \cdot ms$ b) $5 \cdot V$

5. a) $15.2 \cdot V - 9.6 \cdot V \cdot e^{-\frac{t}{68.6 \cdot \mu s}}$ b) $13.9 \cdot V$ c) $5.6 \cdot V + 8.3 \cdot V \cdot e^{-\frac{t}{25.3 \cdot \mu s}}$

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