ENGR 203  Spring 2019  Quiz 1 (04/16/19)

Name  SOLUTION

1. For the circuit shown, switch S1 is in the open position and switch S2 is in the closed position for a long time before \( t = 0 \), when S1 is closed and S2 is opened instantaneously.

   a). Write the values of the inductor voltage and current and the capacitor voltage and current at \( t=0^- \). (5 points).

   \[ v_L(0^-) = 0V \quad i_L(0^-) = 2A \]
   \[ v_C(0^-) = 4V \quad i_C(0^-) = 0A \]

   \[ i = \frac{8}{4} = 2A \]

   b). Write the values of the inductor voltage and current and the capacitor voltage and current at \( t=0^+ \). (10 points).

   \[ v_L(0^+) = 4V \quad i_L(0^+) = 2A \]
   \[ v_C(0^+) = 4V \quad i_C(0^+) = -1A \]

   \[ -8 + 2i_1 + 4 + 2i_1 = 0 \]
   \[ 4i_1 = 4 \Rightarrow i_1 = 1A \]

   \[ i_1 - i_2 = 2A \Rightarrow i_2 = i_1 - 2 = -1A \]

2. Express the following waveform in terms of unit step and ramp functions \( u(t), r(t) \). (10 points).

   \[ f(t) = u(t) - 3r(t) + 5r(t-1) \]
   \[ + 2u(t-2) - 3r(t-2) \]
   \[ - 3u(t-3) + 5r(t-3) \]
   \[ - 4r(t-4) - u(t-5) \]

   OR
   \[ u(t) - 3r(t) + 3r(t-1) + 2r(t-1) - 2r(t-2) \]
   \[ + 2u(t-2) - r(t-2) + r(t-3) - 3u(t-3) \]
   \[ + 4r(t-3) - 4r(t-4) - u(t-5) \]