SIMON FRASER UNIVERSITY
SCHOOL OF ENGINEERING SCIENCE

Fall 2014
ENSC 220: ELECTRIC CIRCUITS I

Midterm Examination No. 2
Wednesday, November 19, 2014

***Duration: 110 minutes. Attempt all problems. Questions are not equally weighted. Closed book and closed notes. Simple calculators (with no graphing/programming functions) are permitted. Calculators, PDAs, laptops, and wireless phones are not permitted. Please write legibly. Illegible text will not be graded.***

1. **(15 points)**

   For the circuit shown in Figure 1, find the voltage ratio $V_{out}/V_s$.

2. **(15 points)**

   In the circuit shown in Figure 2:

   - Replace the circuit to the left of nodes A and B with its Thévenin equivalent.
   - Find $i$.
   - Find the power consumed by the 75 $\Omega$ resistor.

3. **(30 points)**

   Consider the circuit shown in Figure 3:

   - Find the Thévenin equivalent seen by the capacitor for $t \geq 0$.
   - Find $v_c(t)$ for $t \geq 0^+$ assuming $V_C(0^-) = -6\ V$.

4. **(40 points)**

   The switch in the RLC circuit shown in Figure 4 opens at $t = 0$ after having been closed for a long time. Find the complete response of the current $i_L$ and voltage $v_C$ for $t \geq 0$:

   - Using a DC analysis, find the initial conditions $i_L(0^-)$ and $v_C(0^-)$.
   - Find $i_L(0^+)$, $v_C(0^+)$, and $i_C(0^+)$.
   - Using a DC analysis, find the final values of the inductor current $i_L(\infty)$ and capacitor voltage $v_C(\infty)$.
   - Find the characteristic equation and compute its roots. Given the roots, write general forms of the responses $i_L(t)$ and $v_C(t)$.
   - Solve for the unknown coefficients and write the exact expressions for $i_L(t)$ and $v_C(t)$ valid for $t \geq 0$.

FIGURES

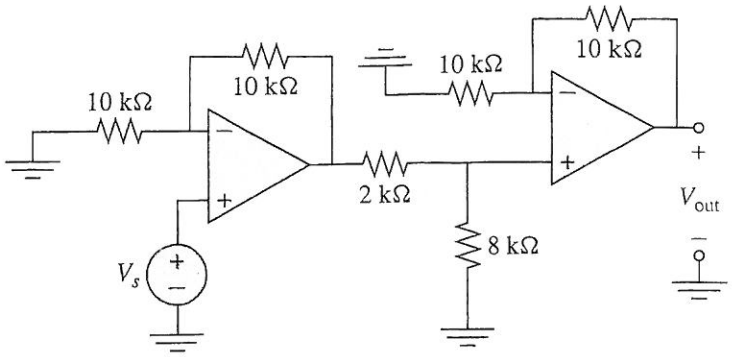


Figure 1.

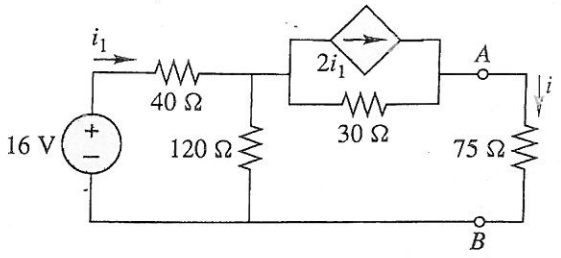


Figure 2.

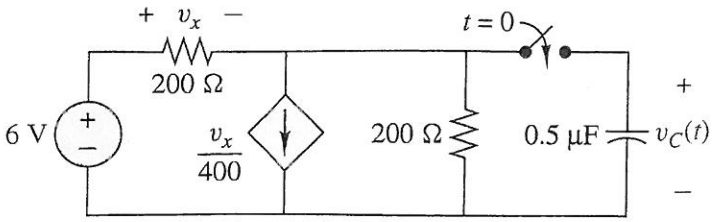


Figure 3.

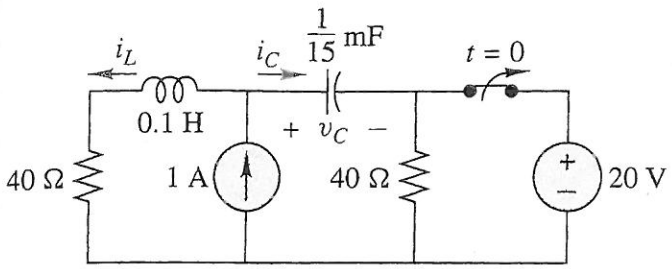


Figure 4.