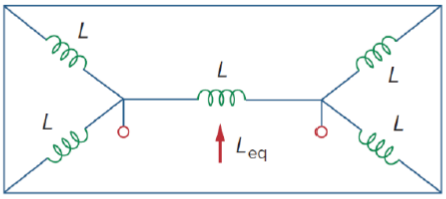
Homework 5

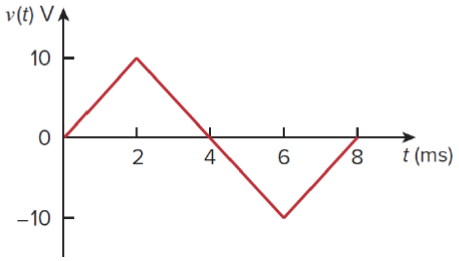
Answer all the required problems for each assignment and round your final solutions to two decimal places, if needed. The optional problems will not be graded but may show up on an exam.

Assignment 1

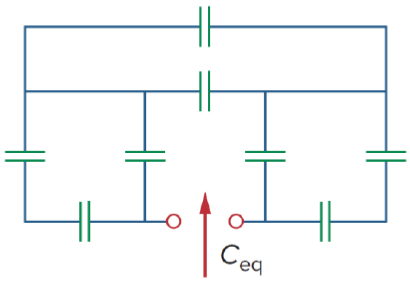
1. Find L_{eq} in each of the following circuit. (15 pts)



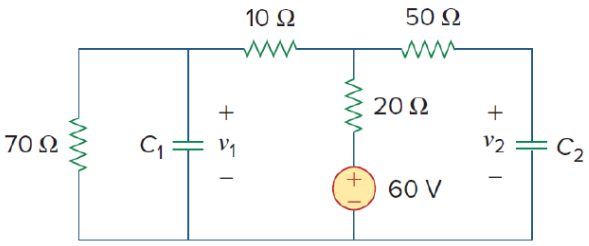
2. The voltage across a 4 μF capacitor is shown in the following figure. Find the current waveform. (Assume the current passing through the capacitor is along the voltage drop on it.) (20 pts)



3. Find C_{eq} in the circuit shown below if all capacitors are 4 μF. (Note: around the sulotion to 2 decimal places) (20 pts)

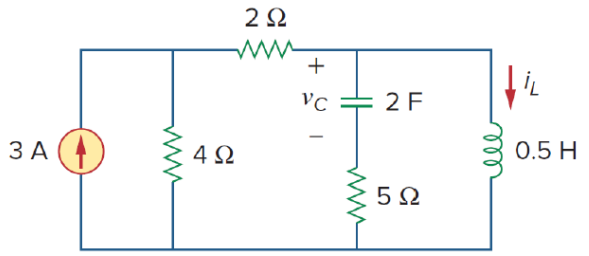


4. Find the voltages across the capacitors in the circuitbelow under dc conditions. (Hints: When capacitors are fully charged, the voltages across the capacitors are constant) (20 pts)



Answers: $\boldsymbol{v_1 = 42\ V, v_2 = 48\ V}$

5. Find v_C, i_L, and energy stored in the capacitor and inductor in the following circuit under dc conditions. (Hint: 1. When capacitors are fully charged, the voltages across the capacitors are constant. 2. When inductors have been driven by dc sources for a long time, the currents in the inductors are constant). (25 pts)



Answers: $\boldsymbol{v_C = 0,\ i_L = 2\ A, w_c = 0\ J, w_l = 1\ J}$

Assignment 2

1. Find the Laplace transform of the following functions.**(7 pts/each x 9 = 63 pts)**
   a. $a(t) = 2\delta(t) + 3 + 4u(t)$
   b. $b(t) = 5 - 5e^{-2t}(1 + 2t)$
   c. $c(t) = 10e^{-4t}cos(20t + 36.9^0)$
   d. $d(t) = 1.5tu(t) - 1.5(t - 10)u(t - 10)$
   e. $e(t) = 1.5tu(t) - 1.5(t - 10)u(t - 10)$
   f. $f(t) = 1.5tu(t) - 1.5(t - 10)u(t - 10) - 15u(t - 10)$
   g. $g(t) = 1.5tu(t) - 1.5(t - 10)u(t - 10) - 3.0(t - 15)u(t - 15)$
   h. $h(t) = (t + 2)u(t - 3)$
   i. $j(t) = 6e^{-2t+11}u(t - 5)$

2. If $f(t)$ satisfies the following equation and $f(0^-) = f'(0^-) = 0,$ find the Laplace transform $F(s),$ where $F(s) = \mathcal{L}\{f(t)\}$. **(22 pts)**

$$3f''(t) + 10f'(t) + 5f(t) = e^{-2t}\sin(t)$$

3. Show that **(15 pts)**

$$\mathcal{L}\{f(at)\} = \frac{1}{a}F\left(\frac{s}{a}\right)$$