ECE 398GG Prof. George Gross
Spring 2023

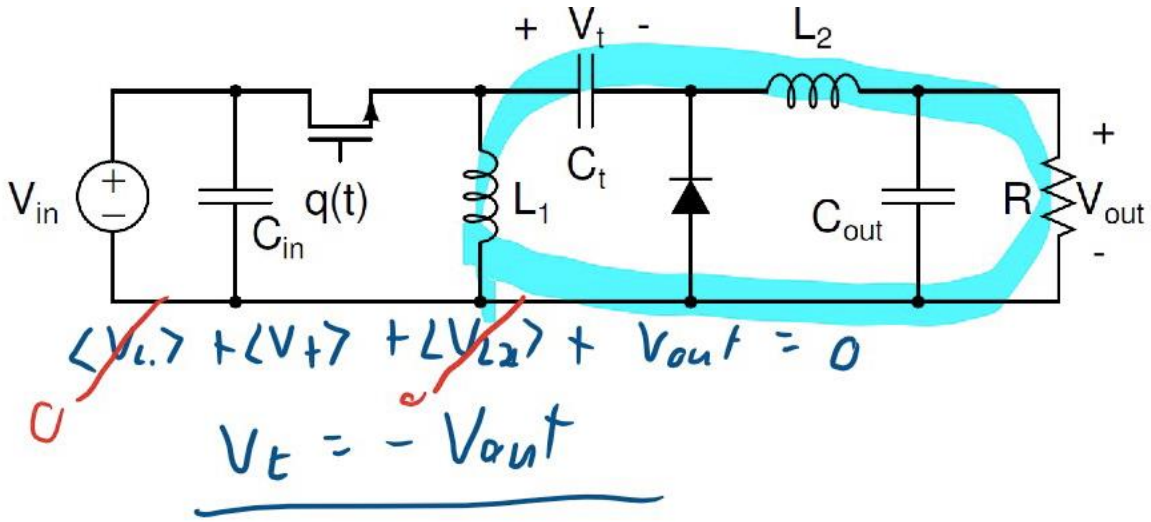
Homework 10 Solution

1. **Identify** a similarity and a difference between levels 1 and 2 chargers.

Both level 1 and 2 are AC and can be in the home or at work; both are also on board

Level 1 charger is at both a lower voltage and lower power than the level 2 charger

2. The circuit below depicts a Zeta converter. Recall that for the periodic steady-state conditions, the following relations hold: $\langle v_L \rangle = 0$ and $\langle i_C \rangle = 0$. Note also that Kirchhoff's voltage law applies for the average conditions equally well. **Determine** $\langle V_t \rangle$, the average of the voltage across the capacitor C_t.



3. Consider an energy buffer for a 6-*kW*, level 2 onboard charger. The battery has a 400-*V* nominal voltage. The distribution grid operates at a frequency of 60 *Hz* and a peak voltage ripple of 8 *V*. **Determine** how large of a capacitor is needed to buffer the twice line-frequency power.

$$C = \frac{P}{2\pi f \cdot V_{RL} \Delta V} = \frac{6000}{2\pi 60 \cdot 400 \cdot 8}$$

$$= 5\,mF$$

1