# Lecture # 5 10/8/2021

- HW 1 due Monday 11:59 pm PT.

Last time

-> General procedure to computes S.S. values in a converter

↳ Using balance eqns.

Today

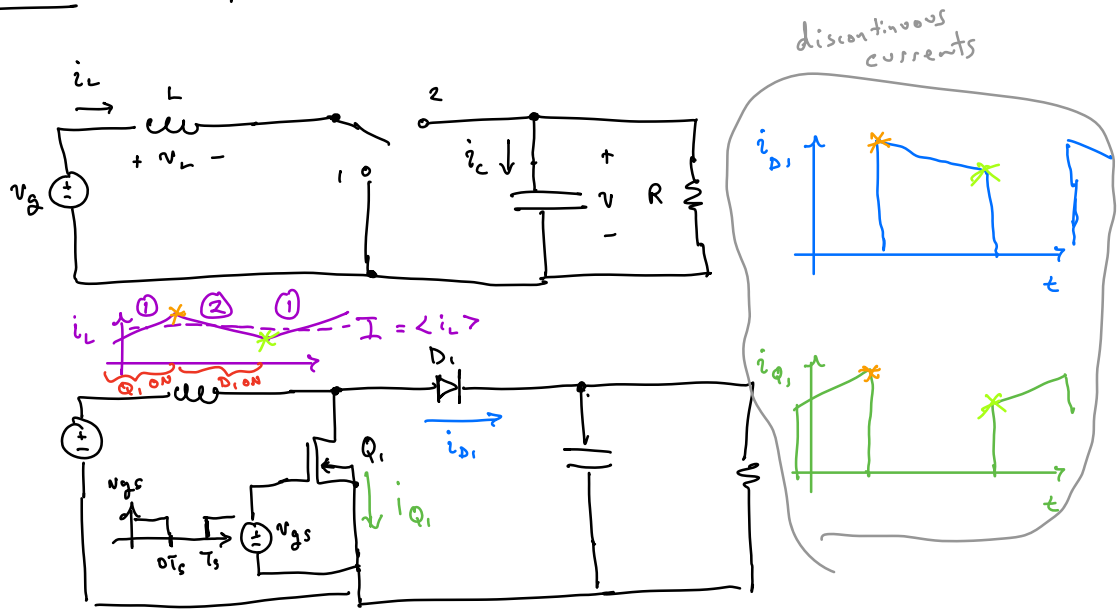
↳ Finish last set of blank pages

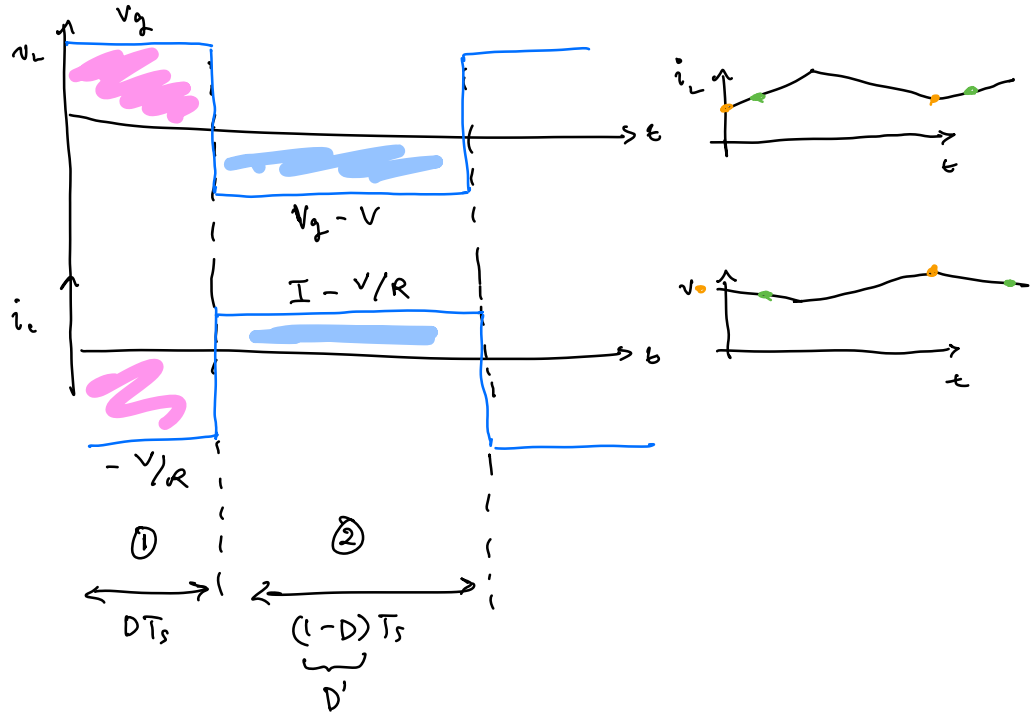
↳ Switch realization

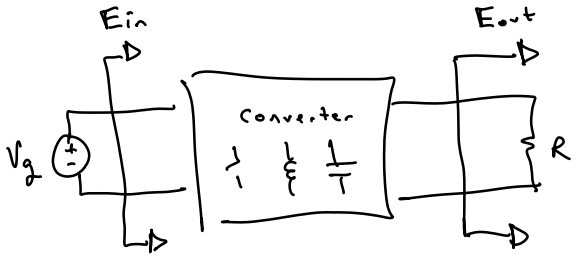
Tip

↳ HW doesn't require a sim., but you can simulate it anyway.

- Boost Example

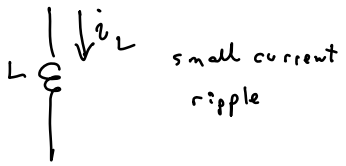




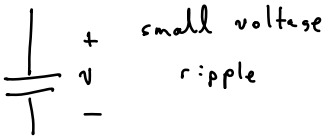

Cap & Inductor Behavior

$v_L = L\frac{di_L}{dt}$




$\approx$

$i_c = C\frac{dv}{dt}$




$\approx$

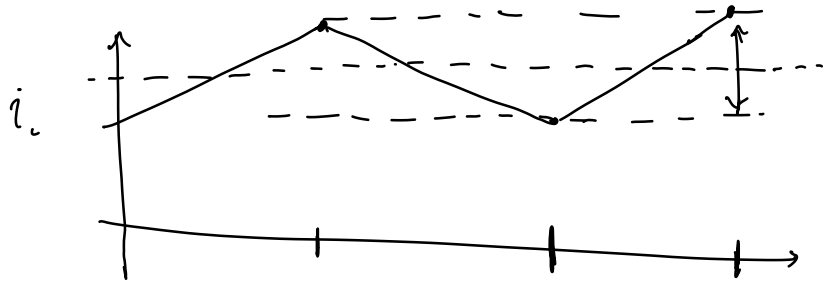
- Computing Ripple Amplitude
  - For L in boost

generally $\frac{di_L}{dt} = \frac{v_L}{L}$

use linear approximation ... rewrite derivative

① $\frac{2\Delta i_L}{\Delta t_①} =$

② $\frac{2\Delta i_L}{\Delta t_②} =$




... similar story for cap

- For C

$$\frac{dv}{dt} = \frac{i_c}{c}$$

↓ use approx for derivative

$$\frac{2\Delta v}{\Delta t_1} =$$

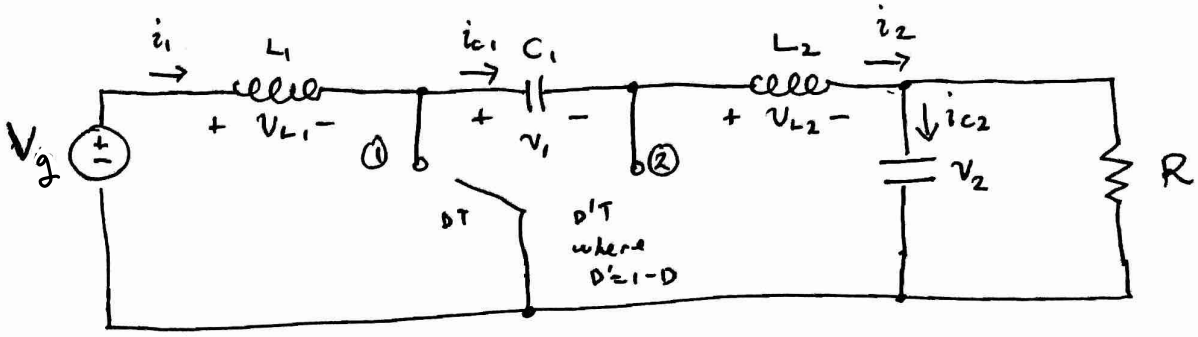
OR

$$\frac{2\Delta v}{\Delta t_2} =$$

— Discontinuous waveforms through switches

- Look @ boost again

# – Cuk Converter Example




Objective:

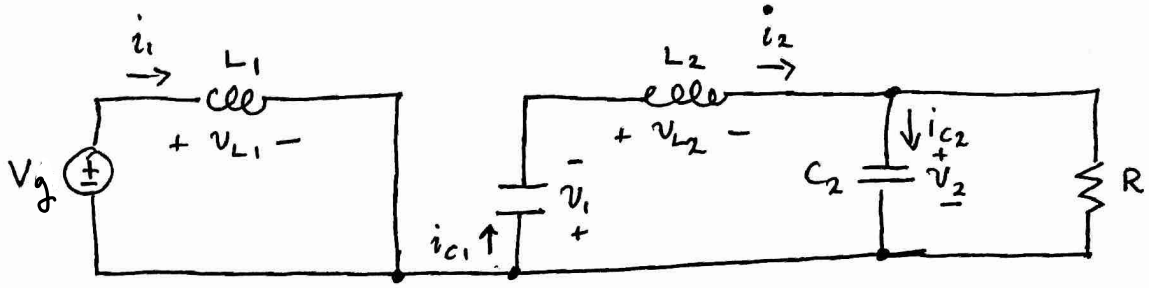
Solve for $V_{s.s.}$ inductor currents & cap voltages (dc component of)

Approach

→ 1) Compute balance eqns

2) Do a bunch of algebra

- Cuk : State # 1




$v_{L1} =$

$v_{L2} =$

$i_{c1} =$

$i_{c2} =$

small ripple approx "SRA"

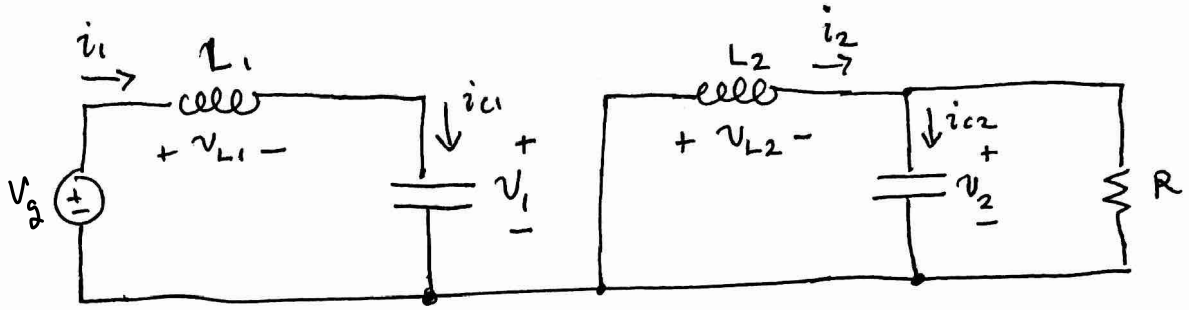
$v_{L1} =$

$v_{L2} =$

$i_{c1} =$

$i_{c2} =$

- Cuk State #2




$v_{L1} =$

$v_{L2} =$

$i_{c1} =$

$i_{c2} =$

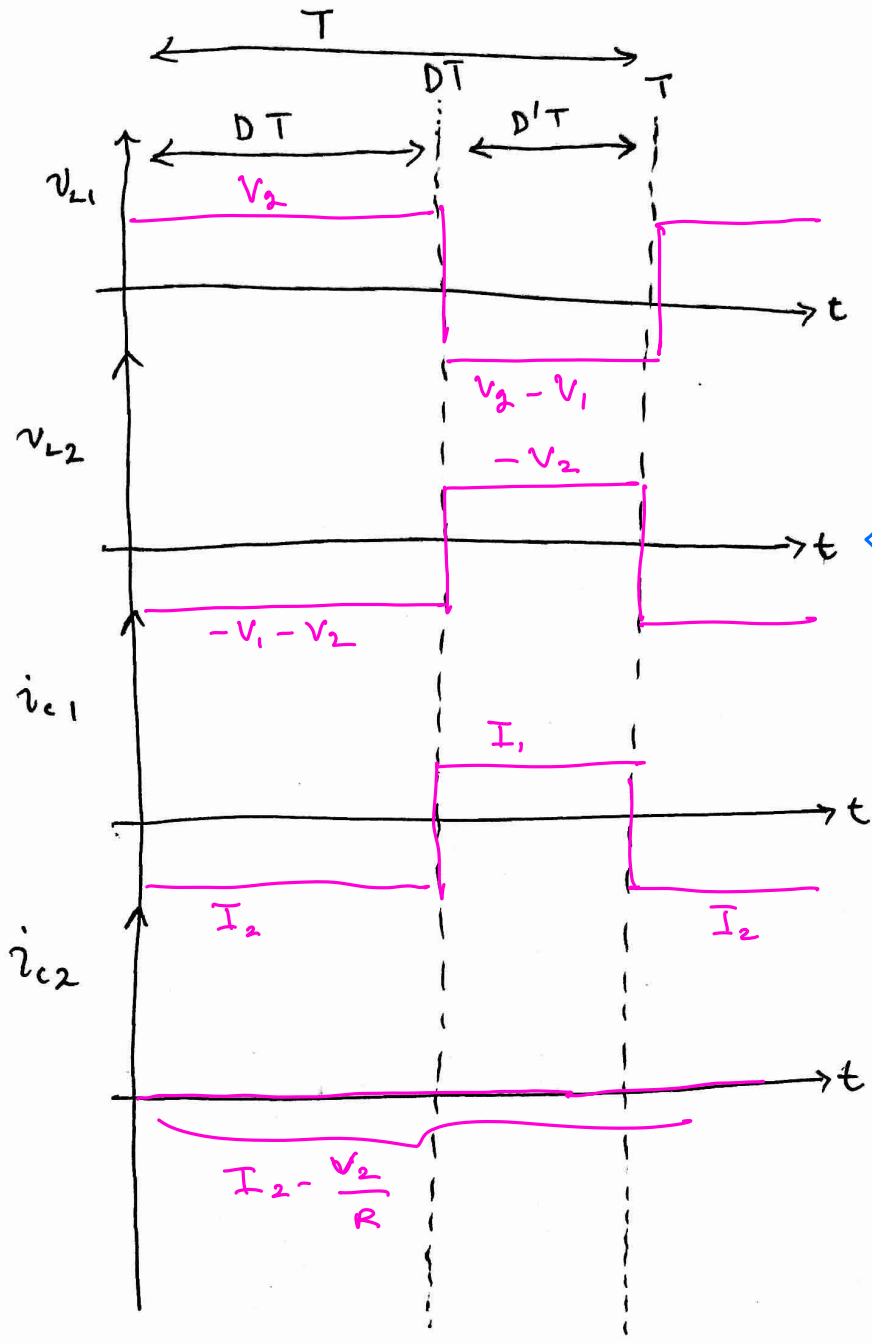
SRA →

$v_{L1} =$

$v_{L2} =$

$i_{c1} =$

$i_{c2} =$




Balance eqns: Set avg to zero.

$\langle v_{L1} \rangle =$ $= 0$

$\langle v_{L2} \rangle =$ $= 0$

$\langle i_{c1} \rangle =$ $= 0$

$\langle i_{c2} \rangle =$ $= 0$

Take stock:

Unknowns:

# of equations =

— Recap of some basic converters