\# works on the principal of PWM
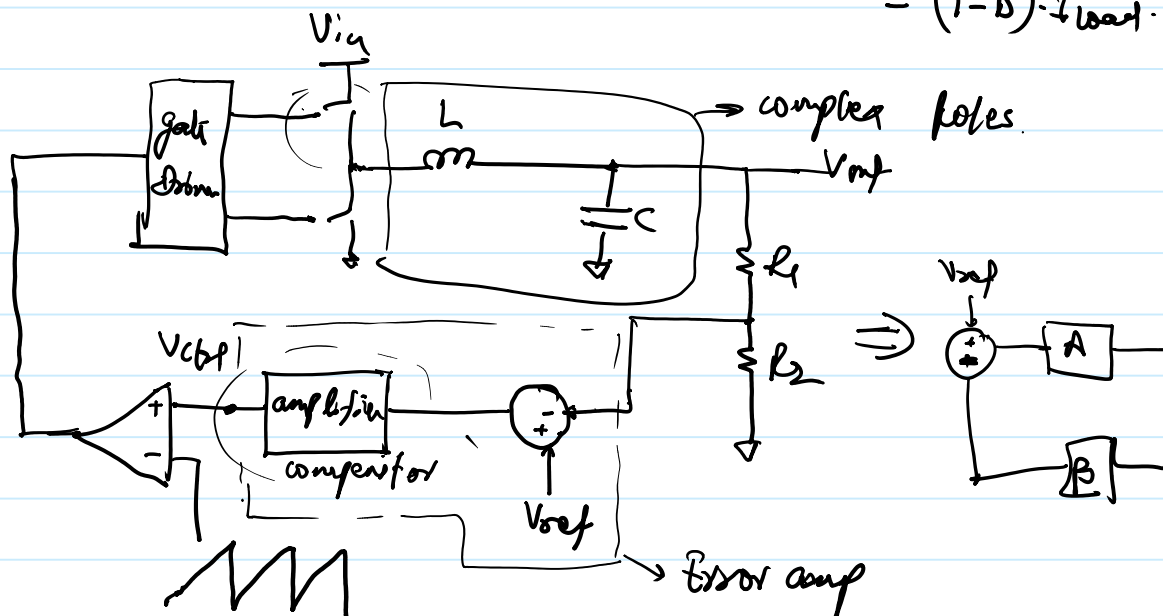
\# preferred for higher power applications due to better efficiency

\# switching converters can be step-up, step-down, inverting

\# dc - dc converter

\# buck → step-down $V_{in} > V_{out}$

\# boost → step-up $V_{in} < V_{out}$

\# Buck-boost → buck + boost & $V_{in} = V_{out}$

\# Inverting → $V_{out} < 0$

$$D = \frac{T_{on}}{T_{sw}}$$

$$F_{sw} = \frac{1}{T_{sw}}$$

$$\omega_0 = \frac{1}{\sqrt{LC}} \quad or \quad f_0 = \frac{1}{2\pi\sqrt{LC}}$$

$$V_{out} = D \cdot V_{dd}$$

$$f_0 << F_{sw}$$

$$V_{out} = D \cdot V_{dd} - I_{load} \cdot R$$

$V_{in} = V_{dd}$

PWM
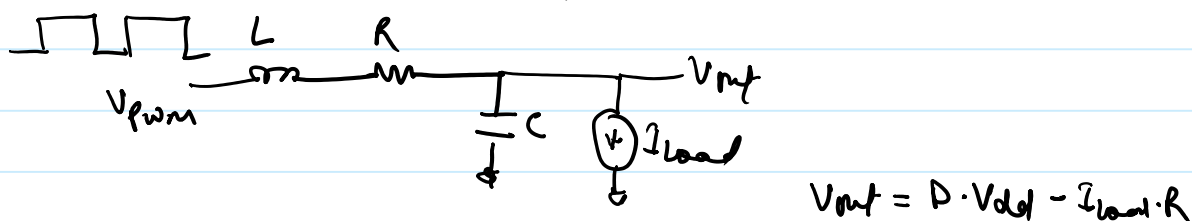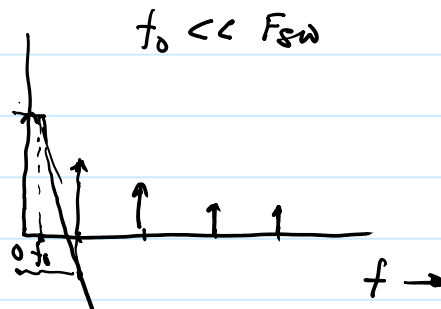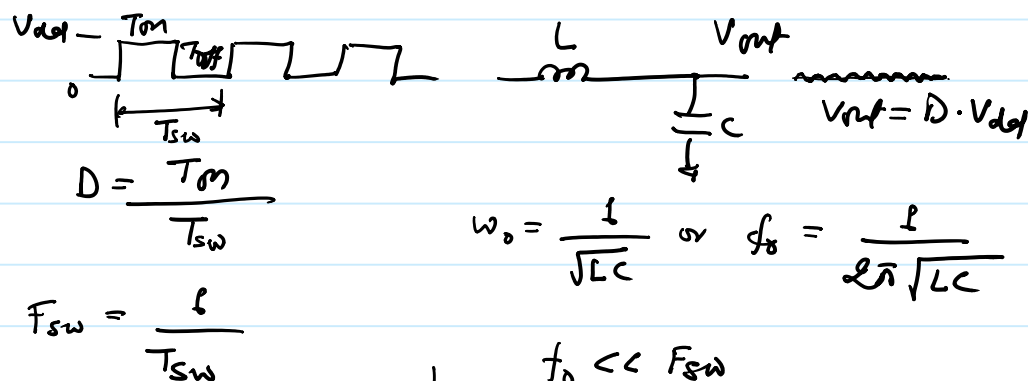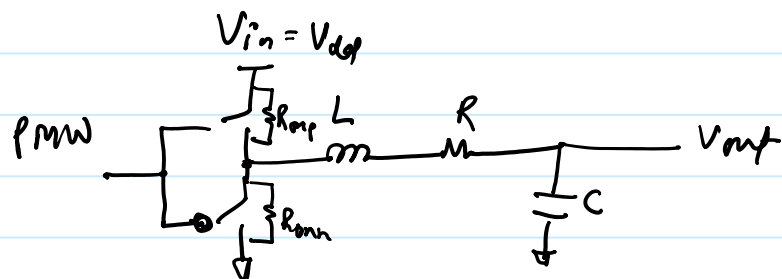
$$V_{out} = D \cdot V_{in} - I_{load} \cdot R - D \cdot I_{load} \cdot R_{onp}$$
$$- (1-D) \cdot I_{load} \cdot R_{onn}$$

V_{in}

→ complex poles

gate Driver

L

C

V_{out}

R_1

R_2

V_{ref}

A

B

V_{ctrl}

amplifier

compensator

$-$ V_{ref}

→ Error amp

Gadb

$g_{m}r_o$

type-N → no. of integrators in a system.

compensators

type-1 → Integral compensation (I)

type-2 → Proportional & Integral (PI)

type-3 → Proportional - Integral - Derivative (PID)