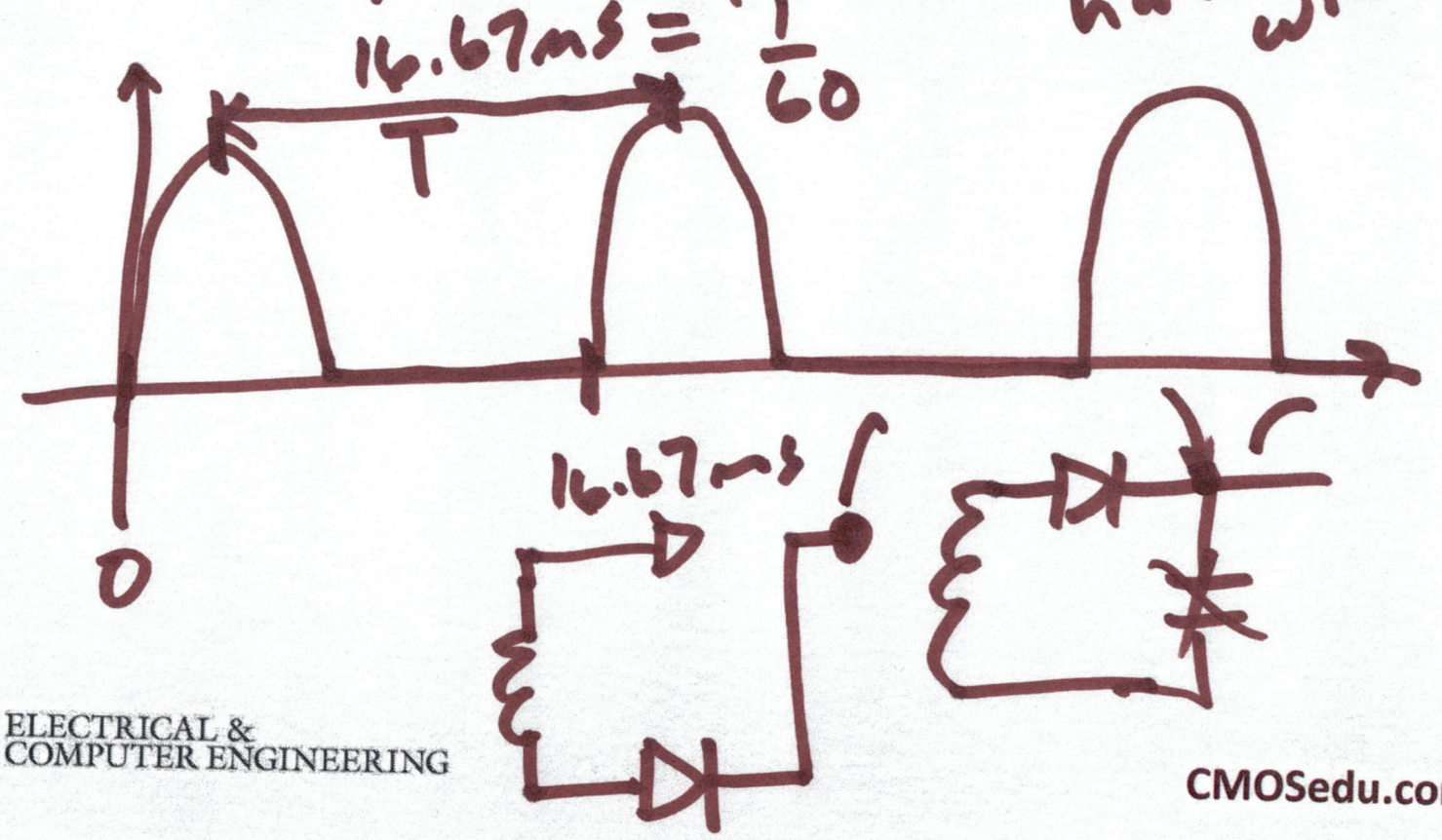
EE 442 / ELG 642
Power Electronics
Lecture 5
Sept 14, 2022



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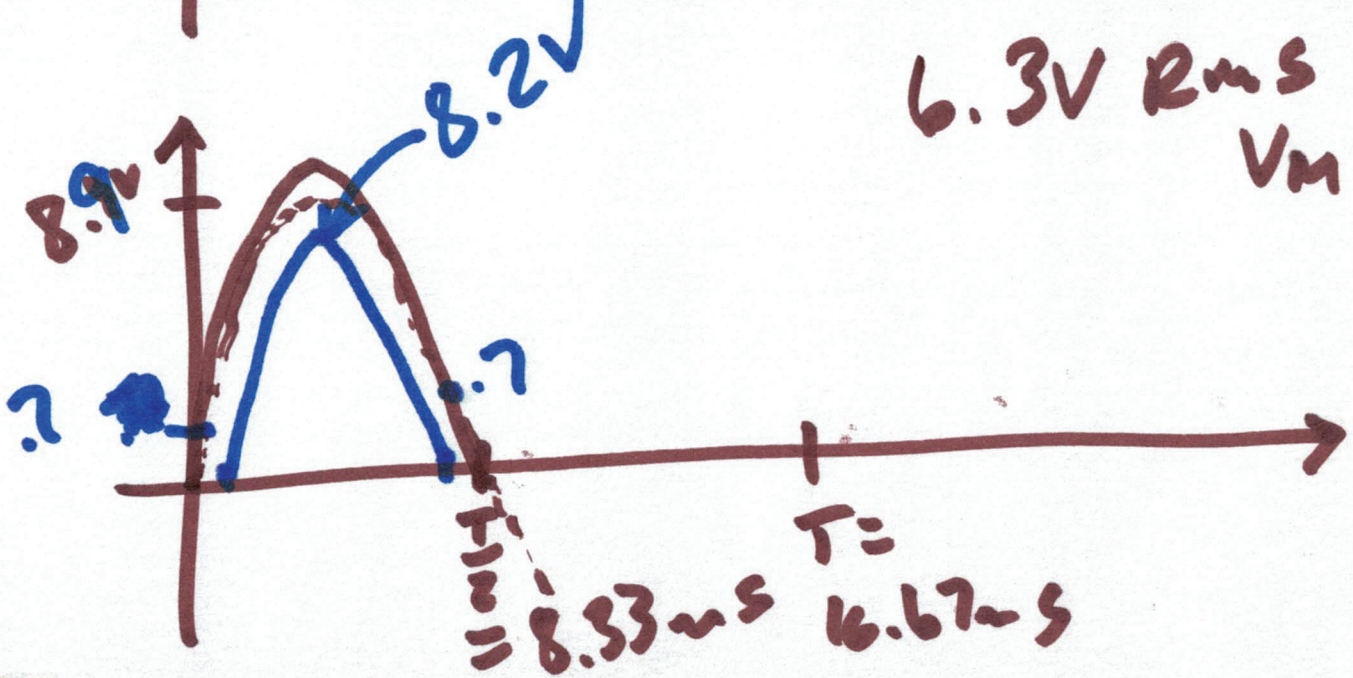
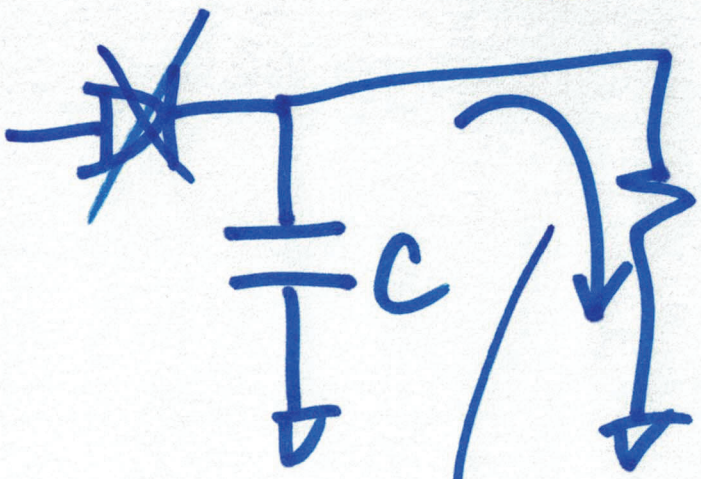
FULL WAVE

6.3V Rms

$V_M = 8.9$





$RC \gg T$

$$I = C \cdot \frac{dV}{dt} = C \cdot \frac{\Delta V}{\Delta t}$$

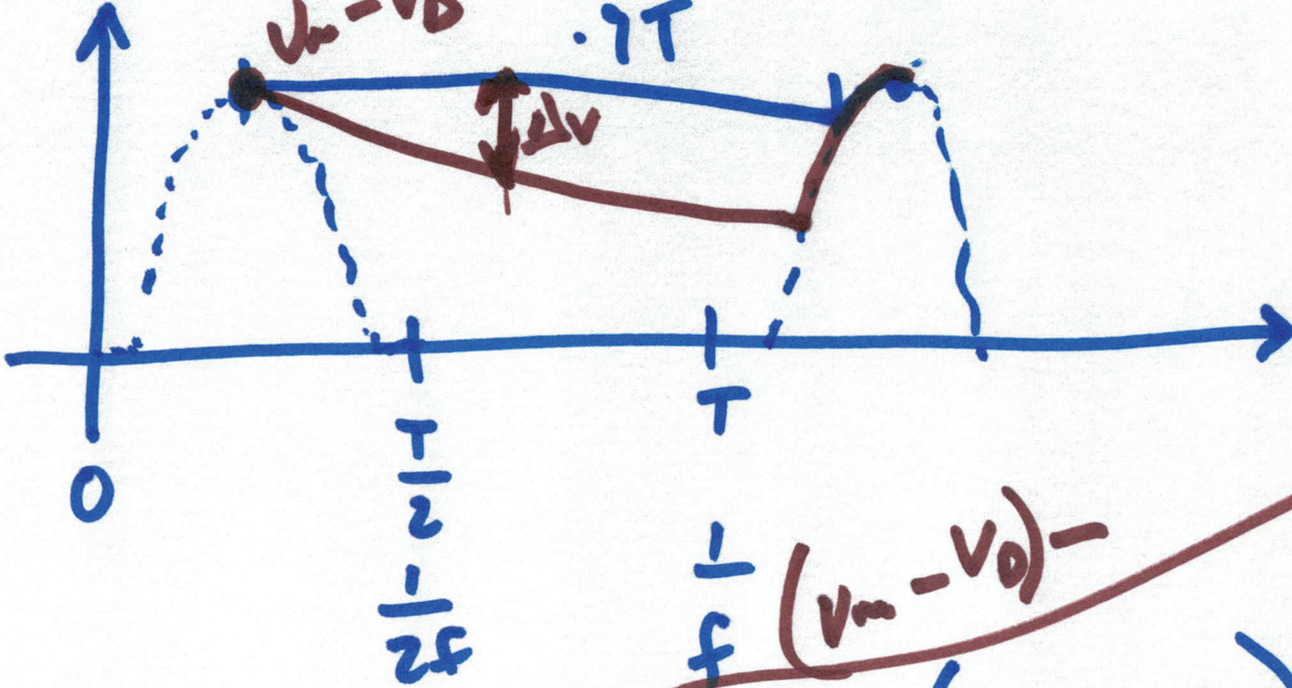
$$\frac{V_m - V_D}{R}$$

$$\frac{V_m - V_D}{R} = C \cdot \frac{\Delta V_{ripple}}{T}$$

approx

half-wave

$$\Delta V_{ripple} = \frac{(V_m - V_D)T}{RC} = \frac{1 \cdot (V_m - V_D)}{fRC}$$



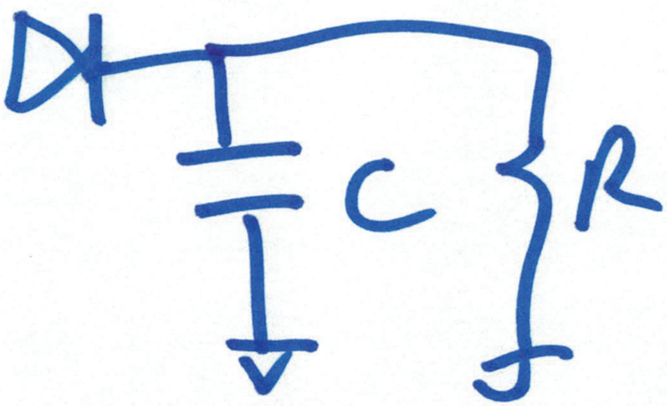
$$(V_m - V_D) - (V_m - V_D)\, e^{-\frac{\alpha T}{RC}}$$

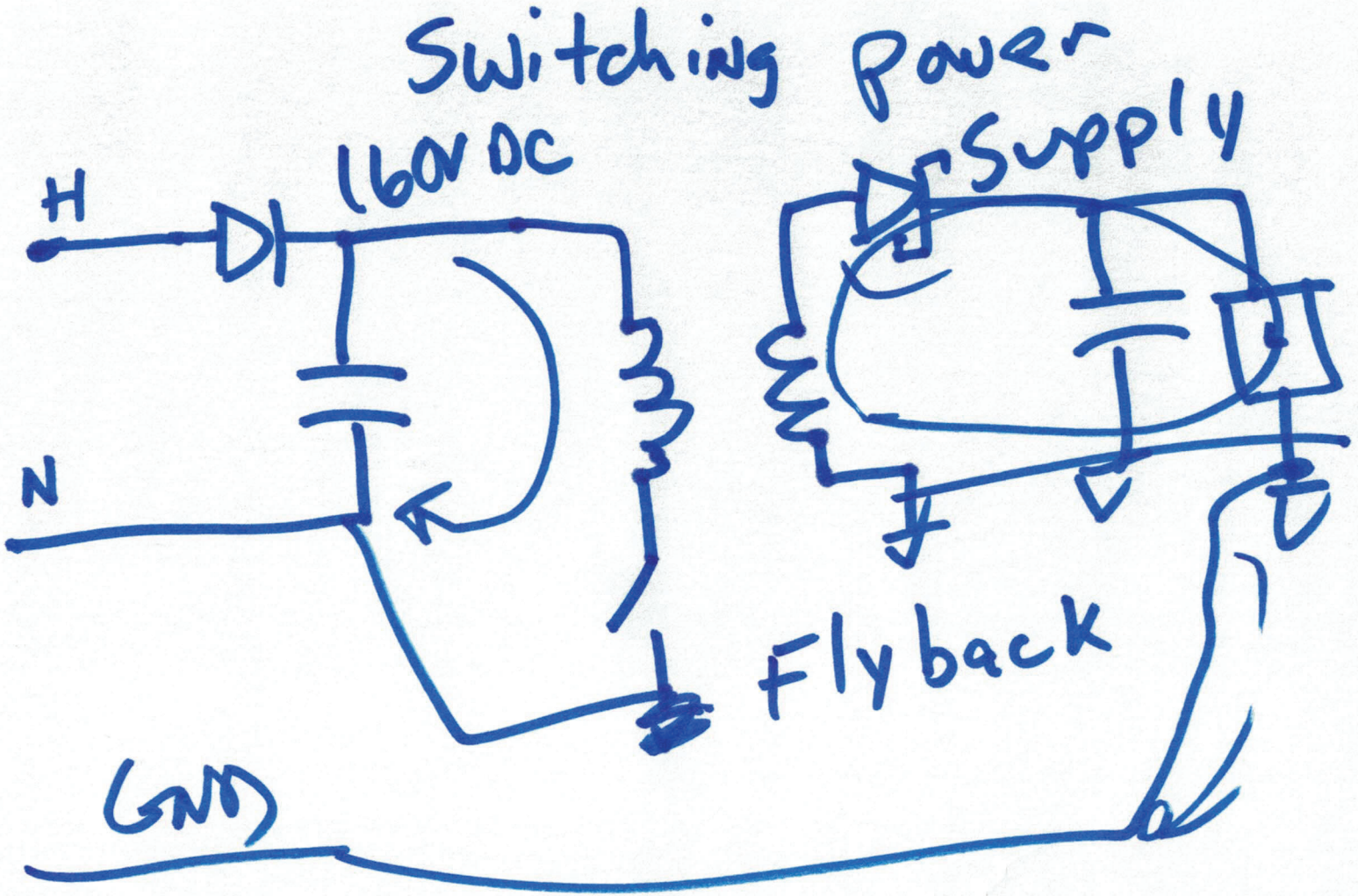
$$V_{OUT} = \Delta V = (V_m - V_D)\, e^{-\frac{\alpha T}{RC}}$$

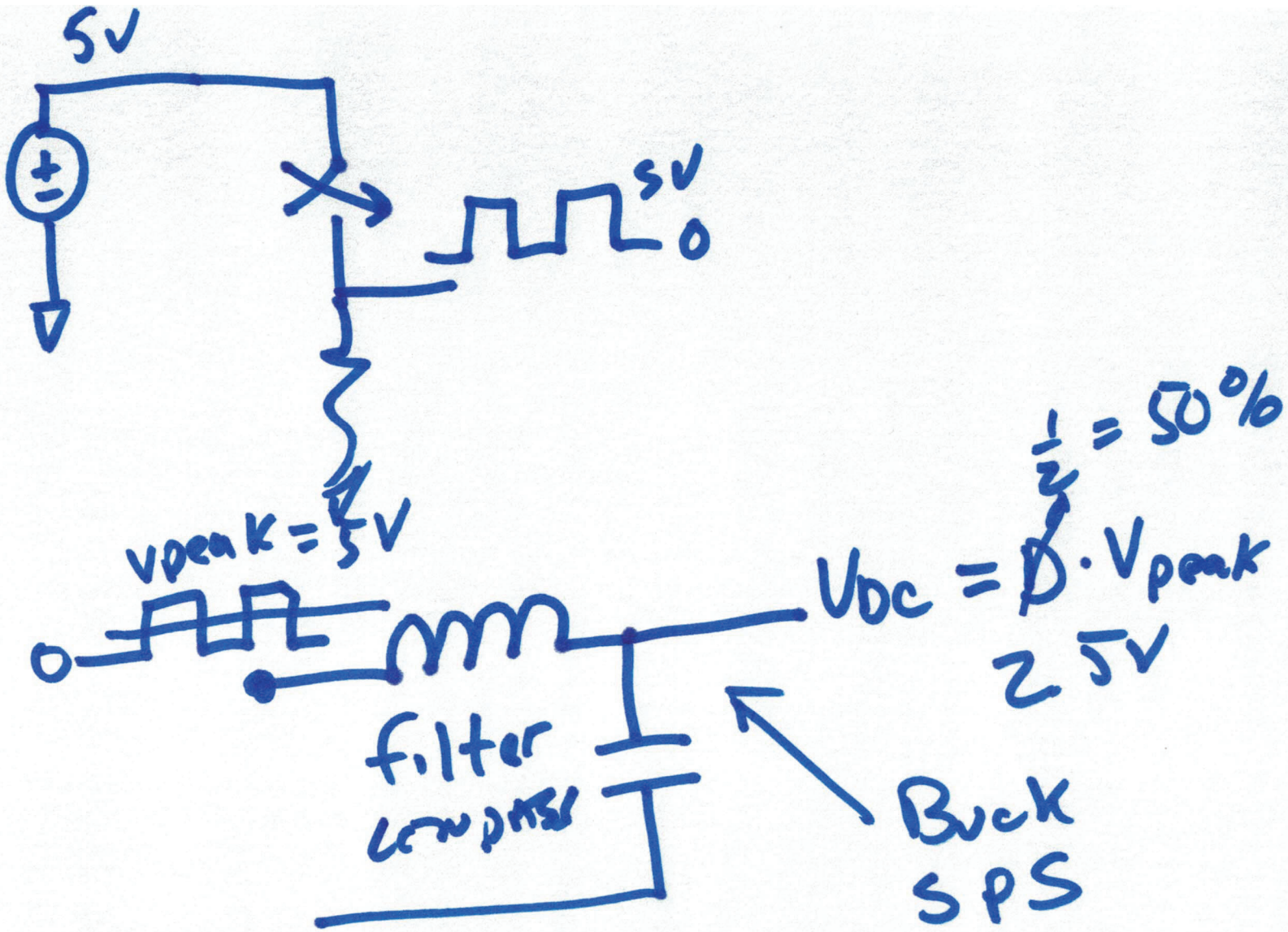
$$V_m - V_{OUT}$$

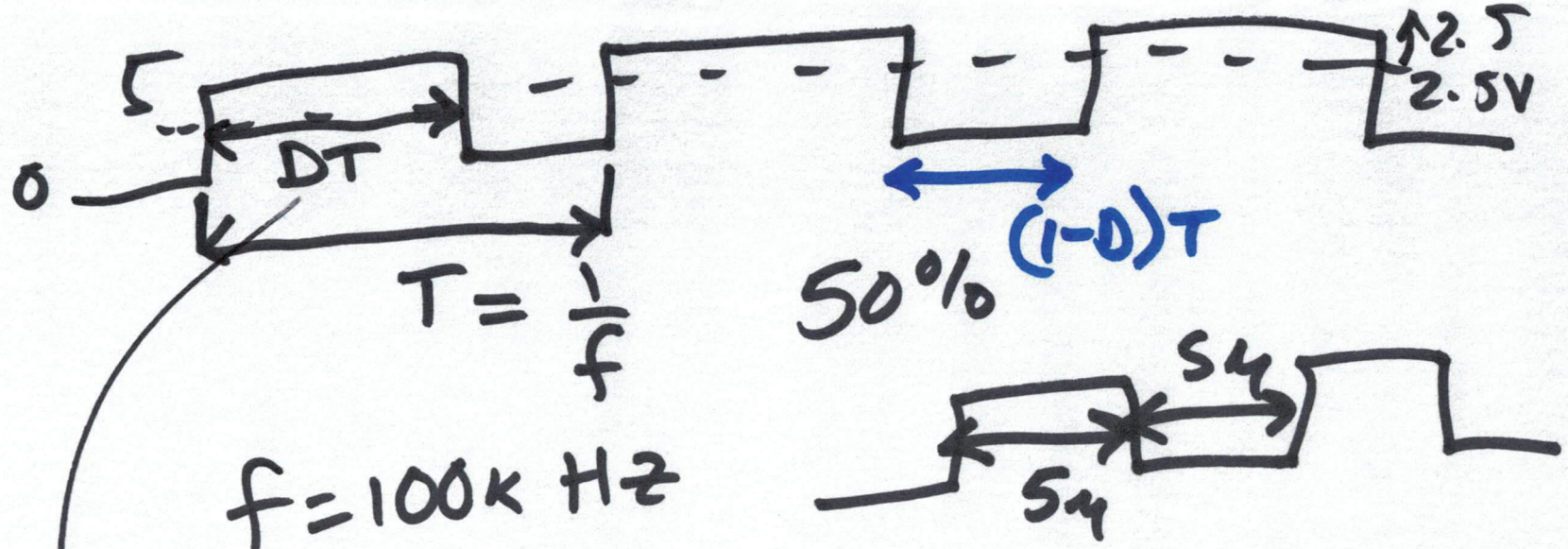
8 → 7.8

$$\frac{8}{\Delta V}\ 7.8$$




Switching Power Supply
160V DC
H
N
Flyback
GND


5V
5V
0
$V_{peak} = 5V$
0
filter
low pass
$V_{DC} = D \cdot V_{peak}$
$\frac{1}{2} = 50\%$
2.5V
Buck
SPS



f = 100k Hz

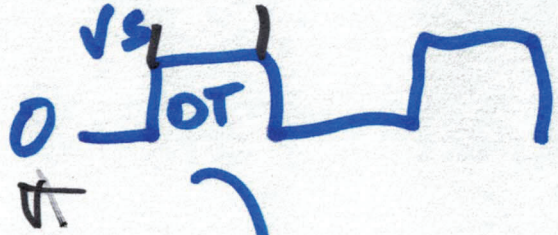
T = 10 µs

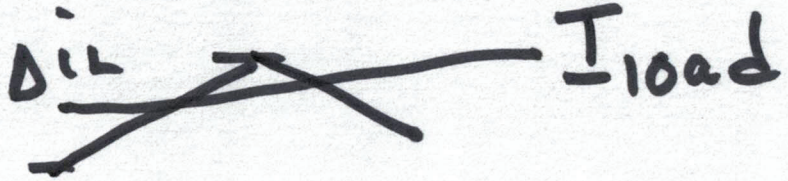
duty cycle

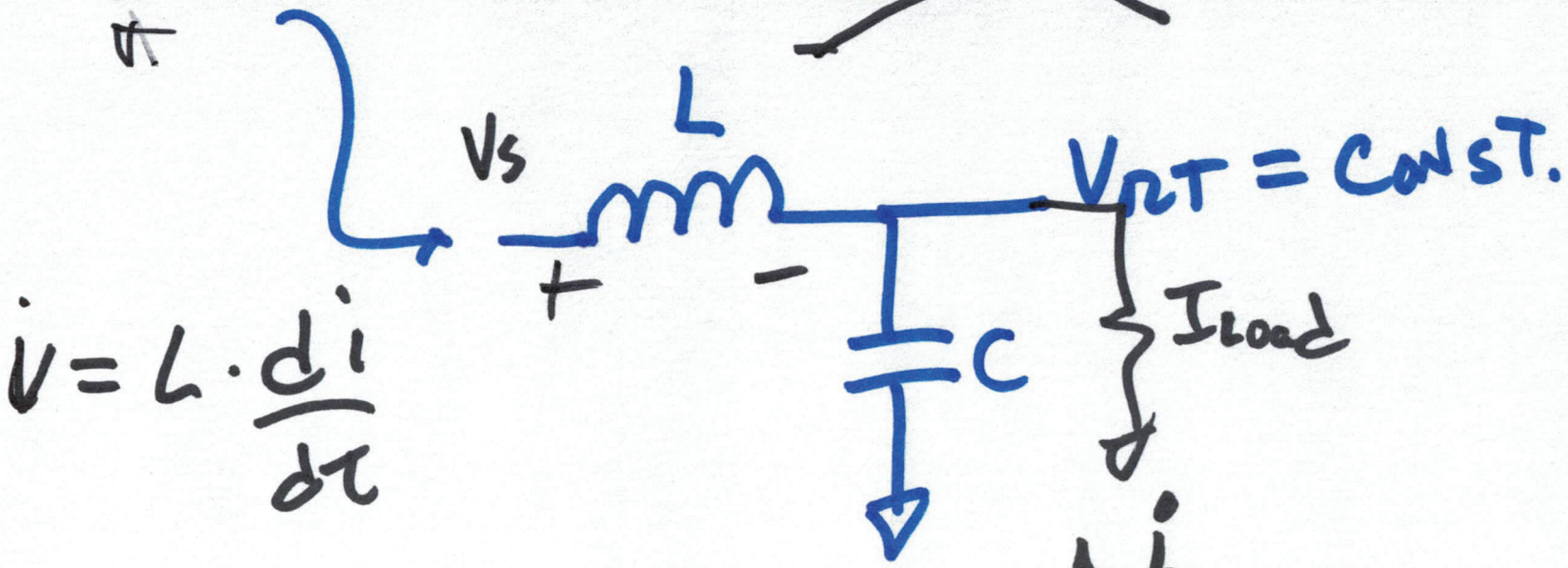
$V_{peak} = 5V$

$V_{offset} = 2.5V$

7)



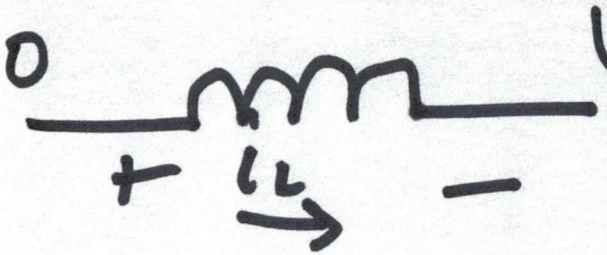




$$v = L \cdot \frac{di}{dt}$$

$$V_S - V_{DT} = L \cdot \frac{di}{dt} = L \cdot \frac{\Delta i_L}{D \cdot T}$$

$$\Delta i_{L,up} = \frac{(V_S - V_{DT}) \cdot D \cdot T}{L}$$



$$L \cdot \frac{\Delta i_{L,dwn}}{(1-D)T} = 0 - V_{OUT}$$

$$\frac{(V_S - V_{OUT})DT}{L} = |\Delta i_{L,dwn}| = \left| \frac{(-V_{OUT})(1-D)T}{L} \right|$$

$$= \Delta i_{L,up}$$

$$V_{OUT} = DV_S$$

$$(V_S - V_{OUT})DT - V_{OUT}(1-D)T = 0$$

$$V_S \cdot DT - V_{OUT} = 0$$