

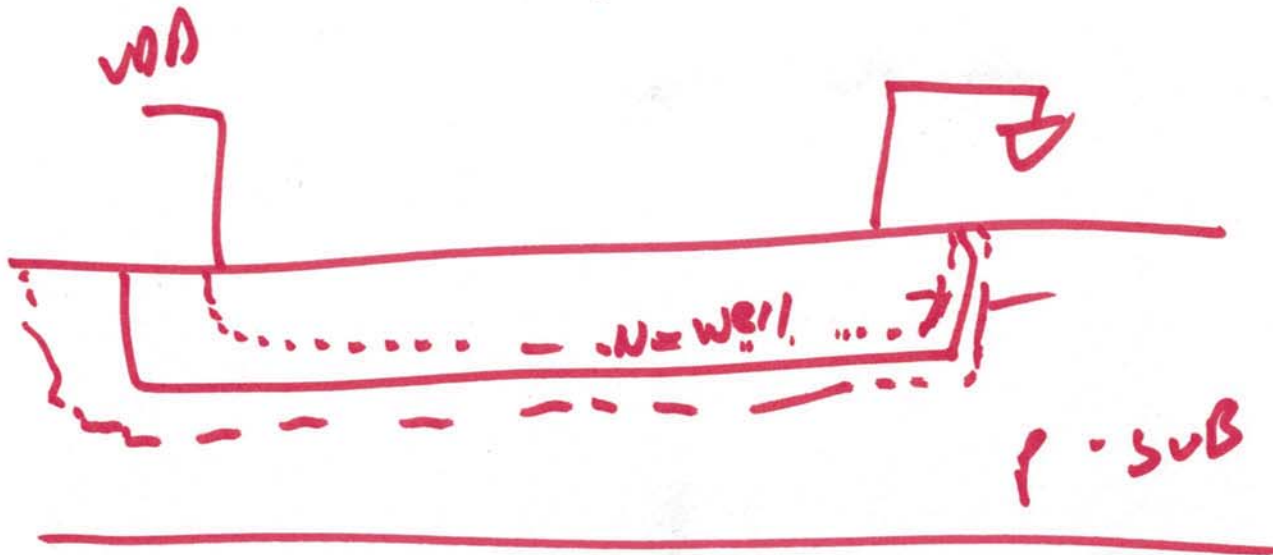
EE 421 / ECG 621

Lecture 14

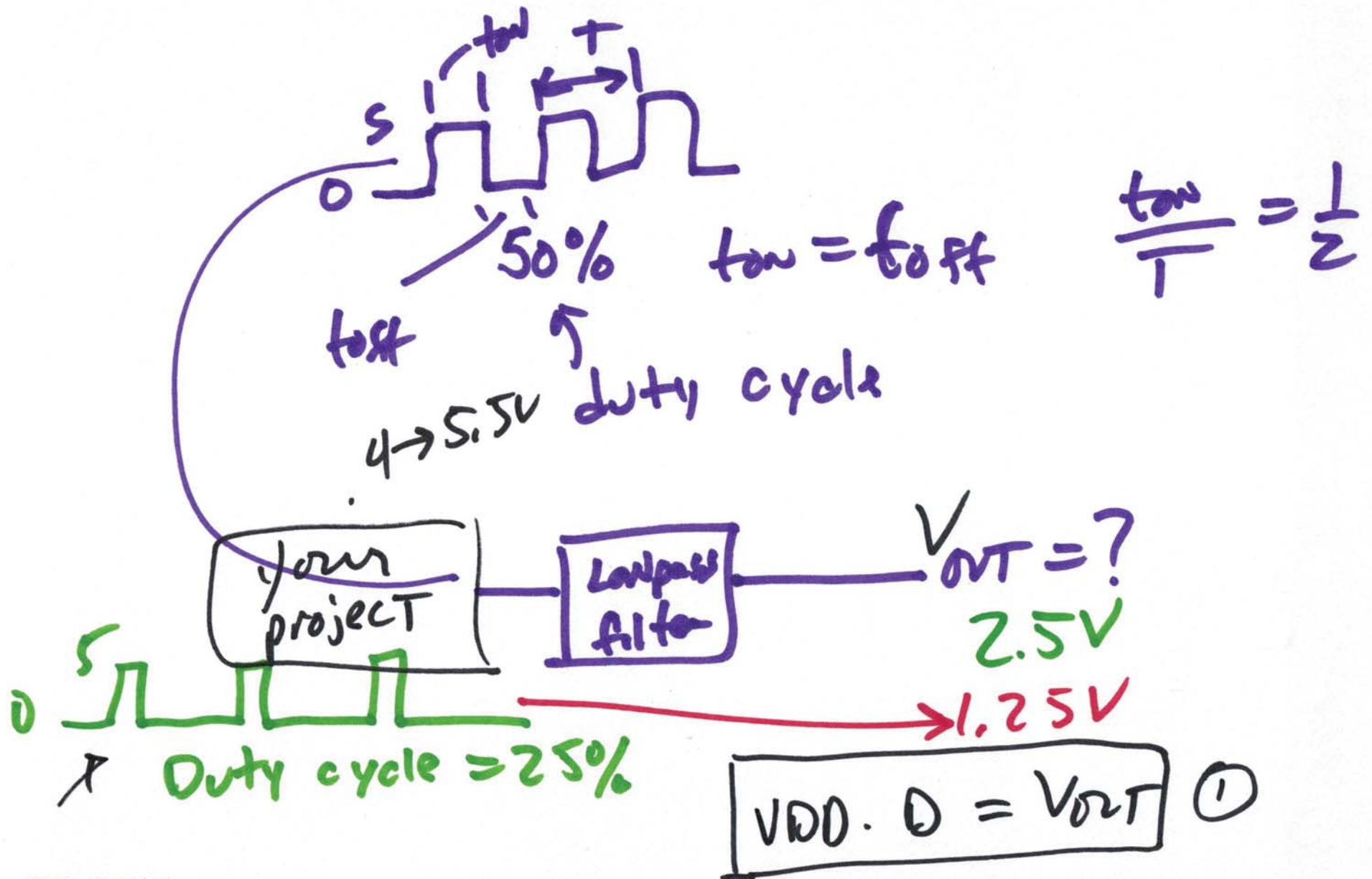
OCT. 24, 2016

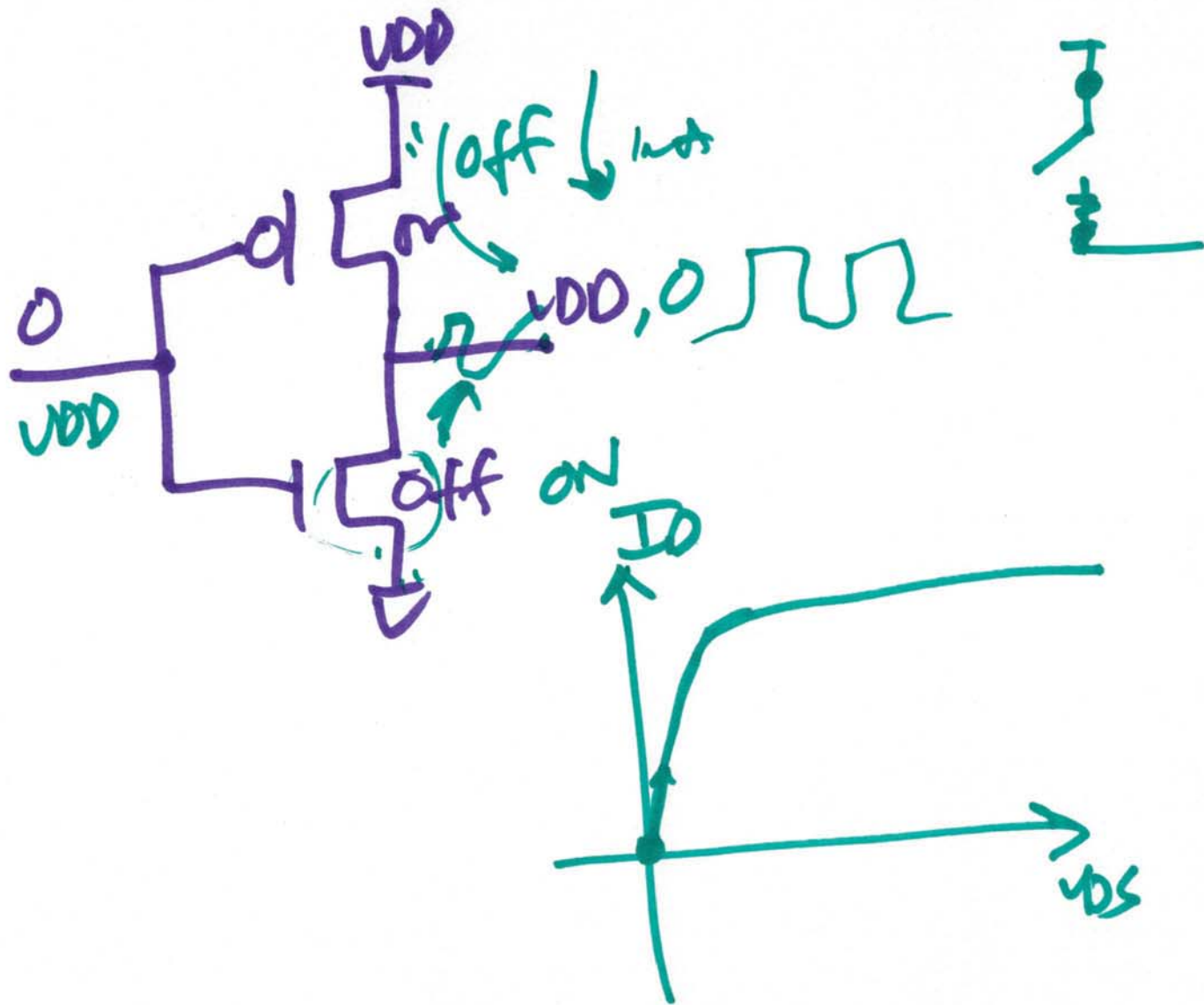
$\int \frac{1}{r} dr = \ln r + C$

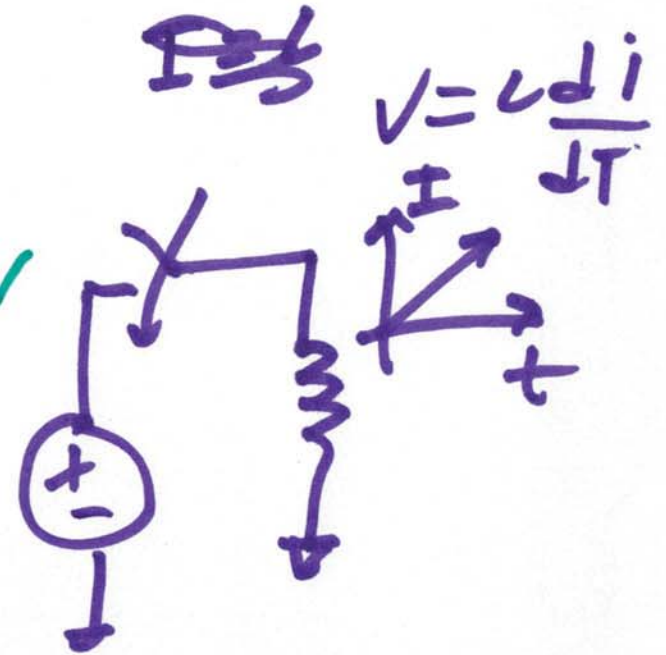
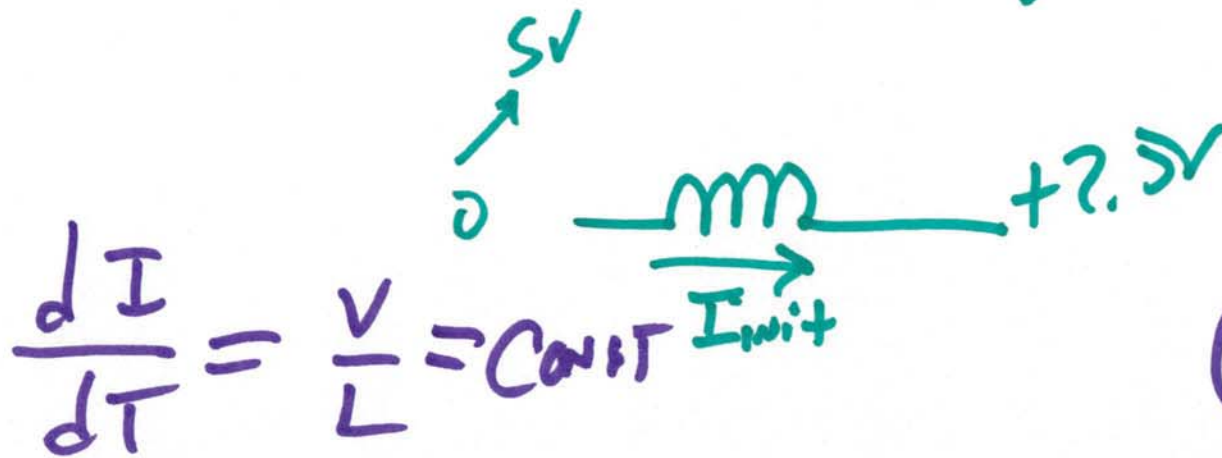
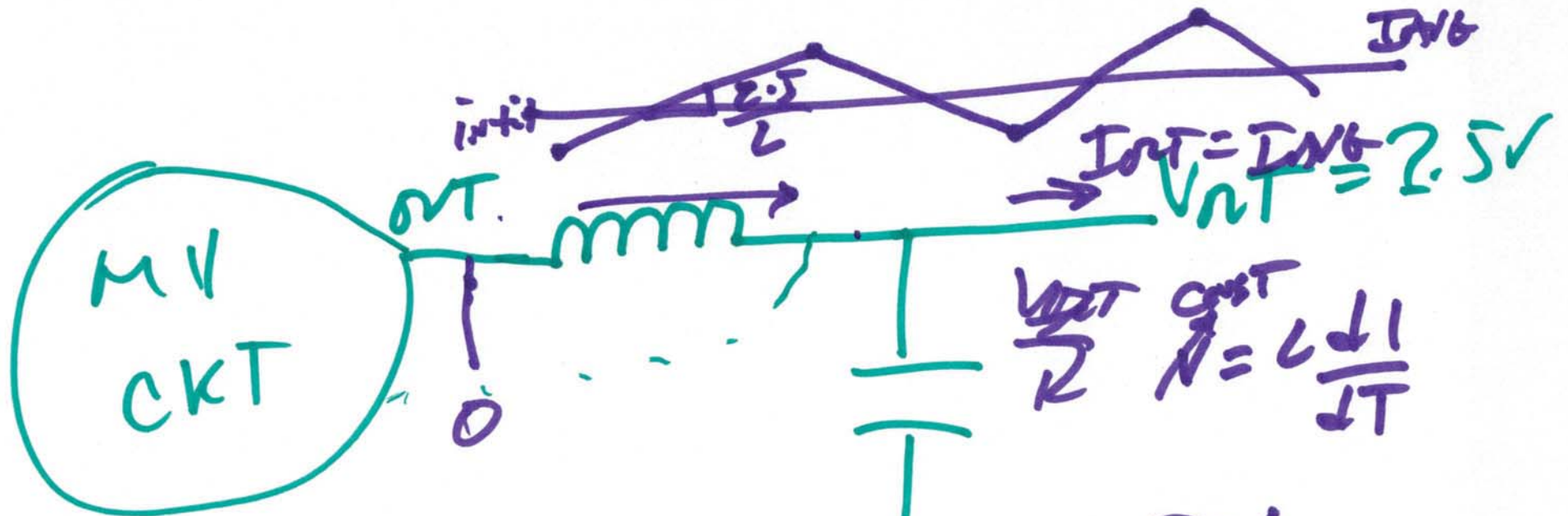
$$C = \frac{\epsilon A}{d}$$

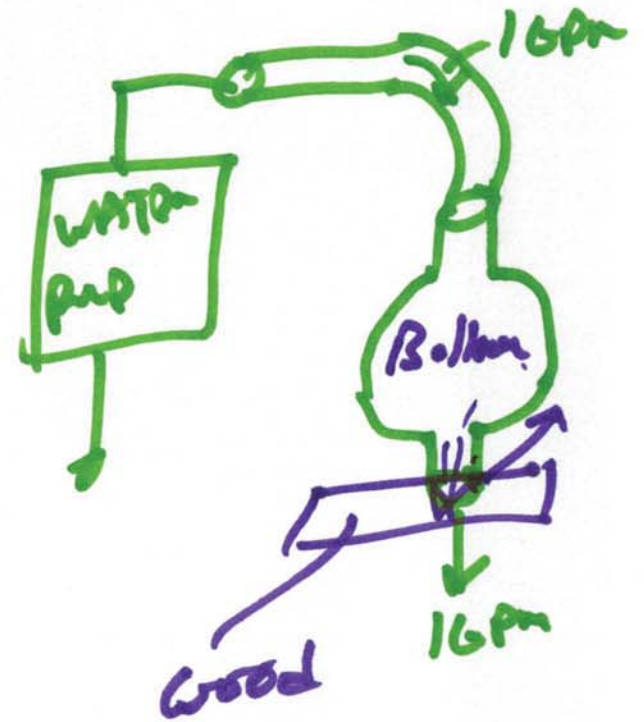
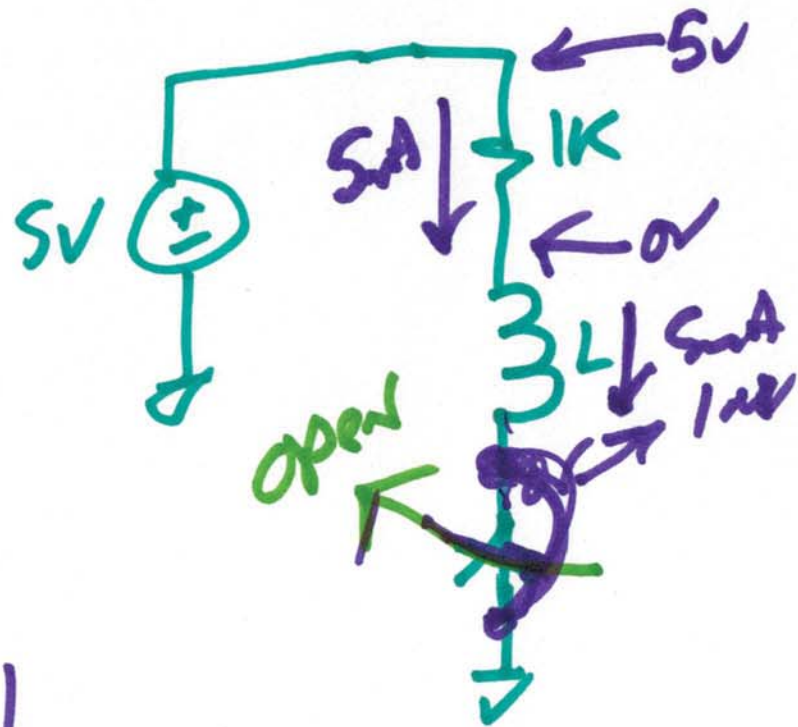


# Buck converters

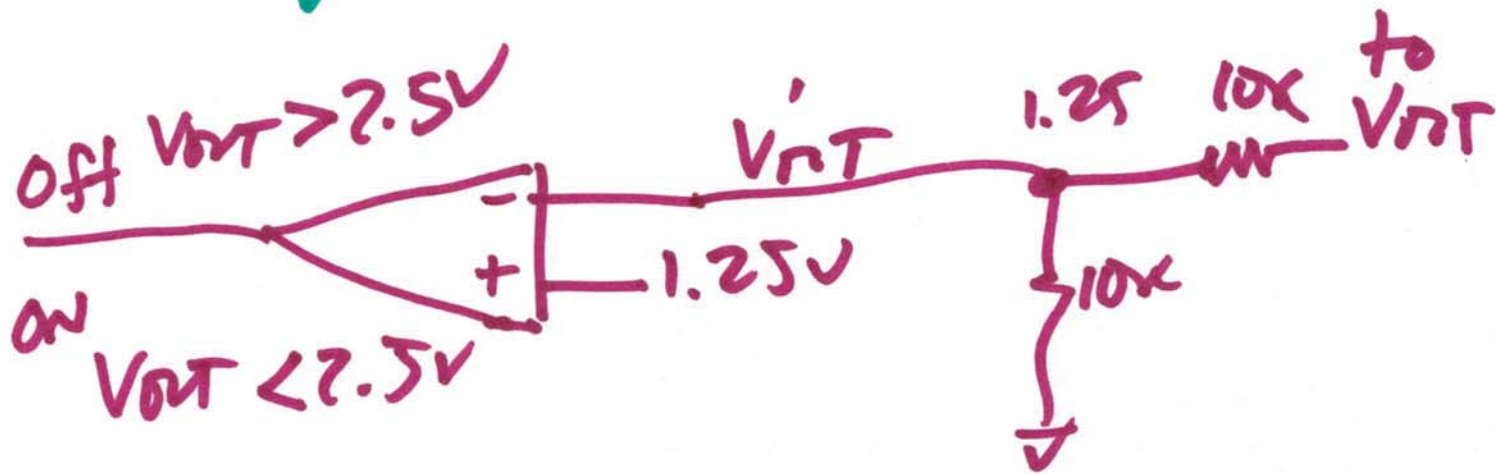
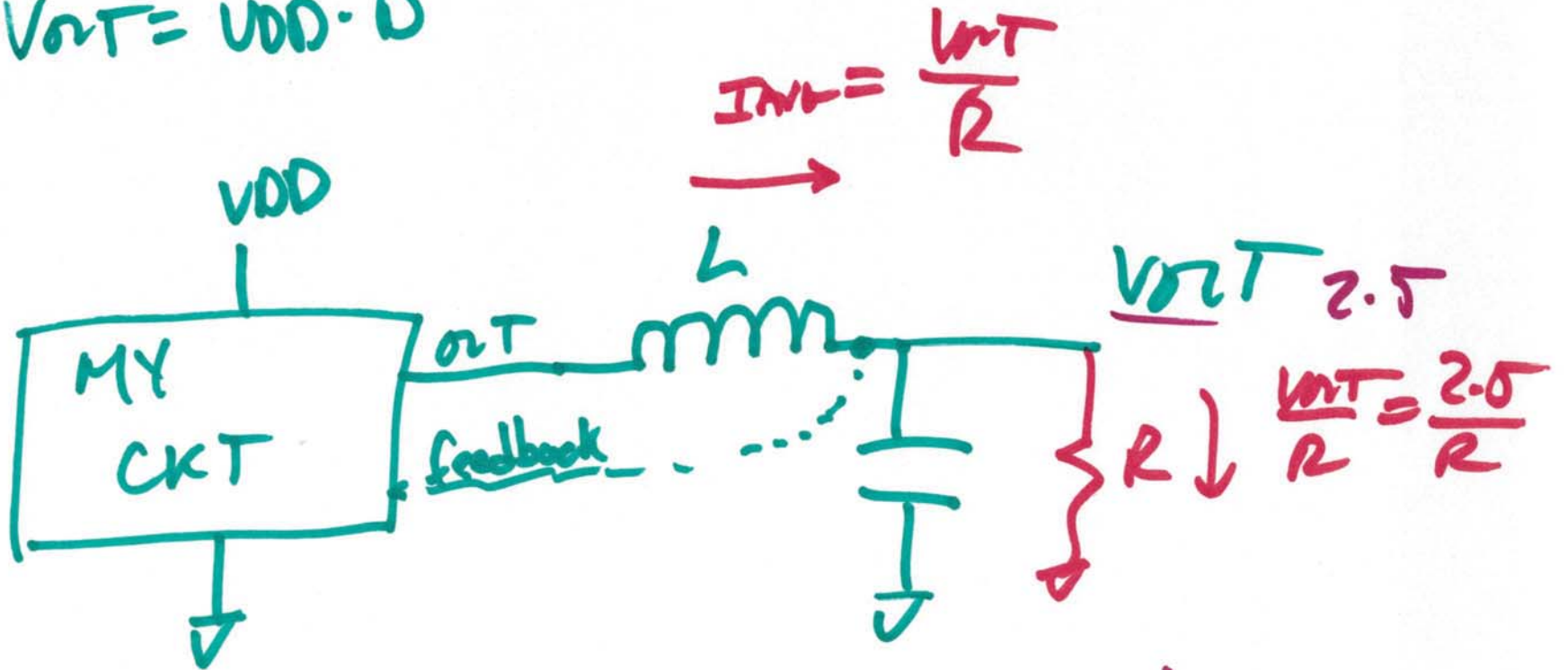


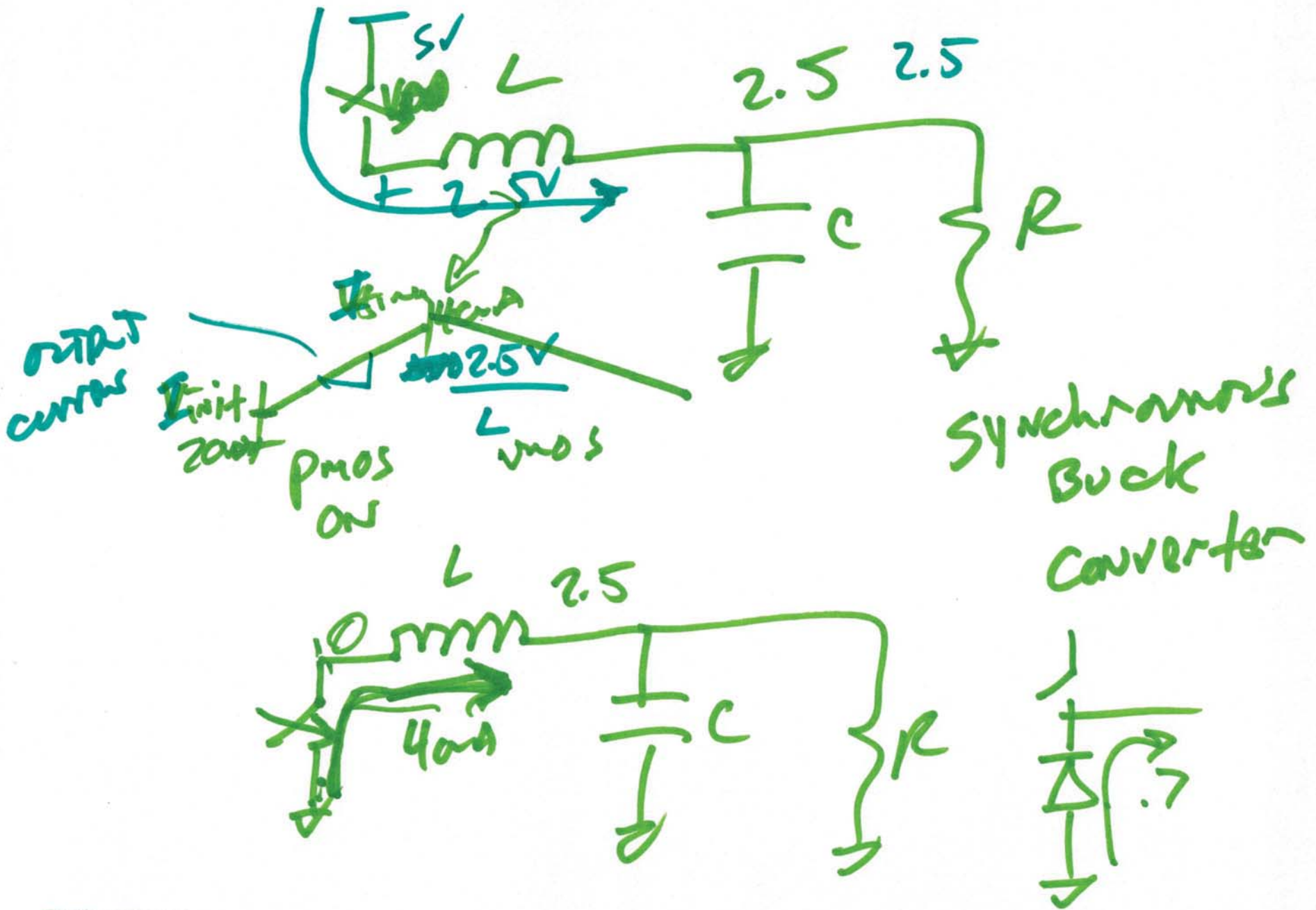




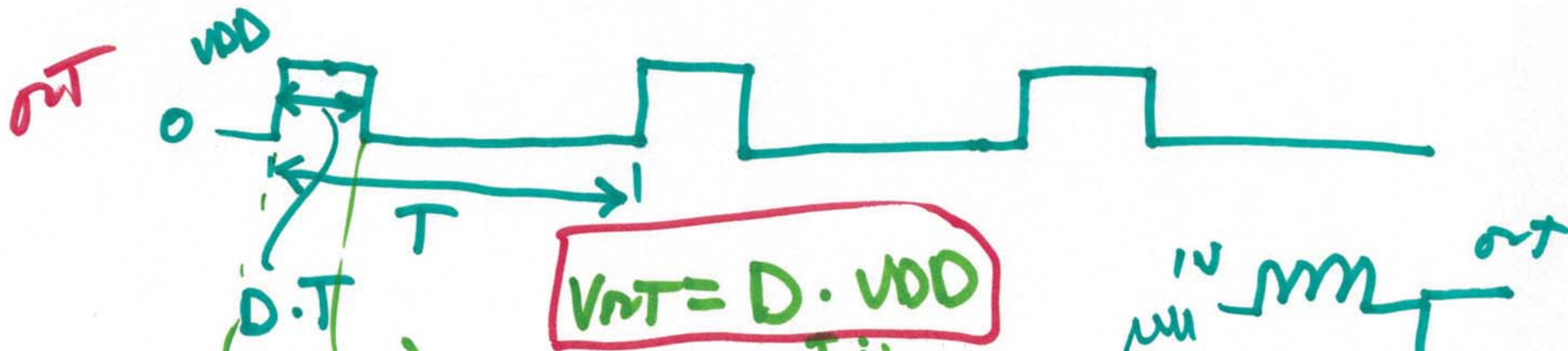


$$V_{out} = V_{DD} \cdot D$$

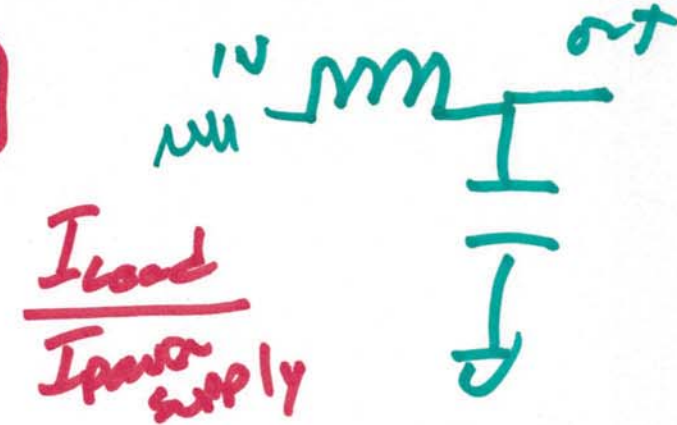




1)



$$V_{DD} - V_{VT} = \frac{dV}{dt} = \frac{\Delta I}{DT} = \frac{I_{MAX} - I_{MIN}}{DT}$$



$$\frac{I_{load}}{I_{power\ supply}} \quad * \quad \frac{V_{DD} - V_{VT}}{L} = \frac{I_{MAX} - I_{MIN}}{D \cdot T}$$

$$* \quad \frac{0 - V_{DUT}}{L} = \frac{I_{MAX} - I_{MIN}}{(1-D) T}$$

$$I_{AVG} = \frac{V_{VT}}{R} = \frac{I_{MAX} + I_{MIN}}{2}$$

for ramp



$$V_{\text{VT}} = D \cdot V_{\text{DD}}$$

$$\frac{2.5}{L} = \frac{2 \mu\text{A}}{\frac{1}{2} \mu\text{s}}$$

$$\frac{V_{\text{DD}} - V_{\text{VT}}}{L} = \frac{I_{\text{MAX}} - I_{\text{IN}}}{DT}$$

$$L = \frac{2.5 \cdot \frac{1}{2} \mu\text{s}}{2 \mu\text{A}}$$

$$= 0.625 \text{ mH}$$

$$0 - V_{\text{VT}} = \frac{I_{\text{MAX}} - I_{\text{IN}}}{(1-D)T}$$

$$D = \frac{1}{2}$$

$$I_{\text{AVG}} = \frac{I_{\text{MAX}} + I_{\text{IN}}}{2}$$

$$V_{\text{DD}} = 5\text{V}$$

$$V_{\text{VT}} = 2.5\text{V}$$

$$T = 1 \mu\text{s}$$

$$I_{\text{AVG}} = 10 \mu\text{A}$$

$$I_{\text{MAX}} = 11 \mu\text{A}$$

$$I_{\text{IN}} = 9 \mu\text{A}$$

a)