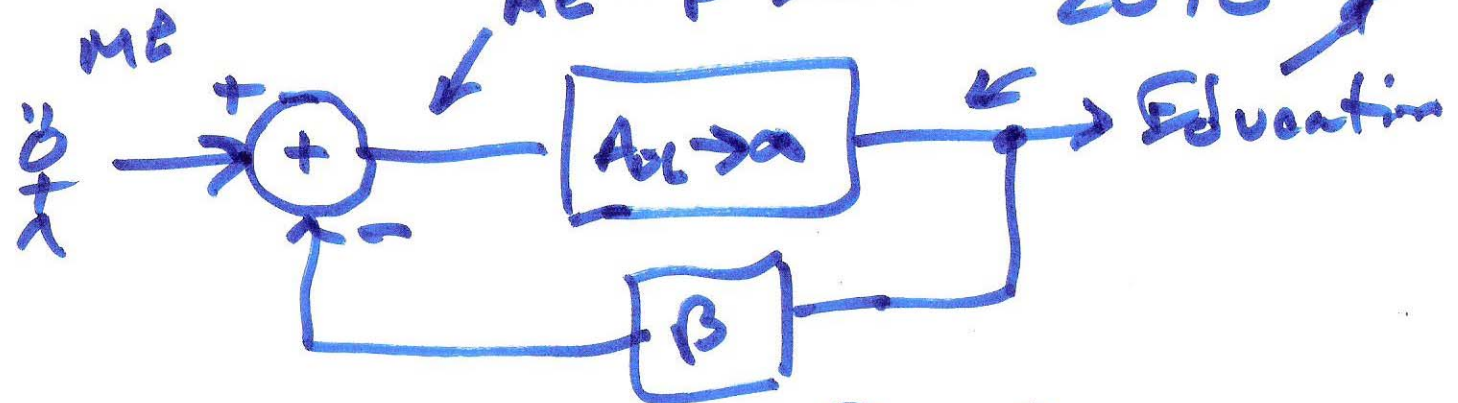


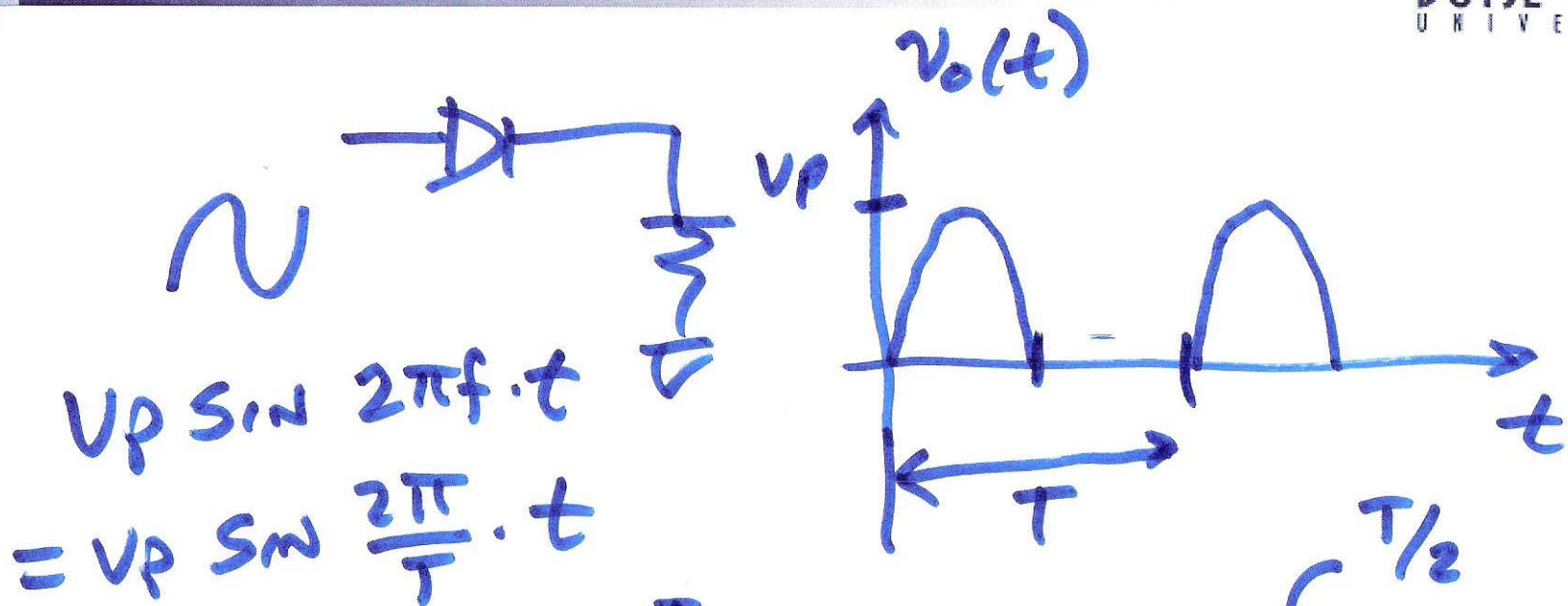
Lecture 7 Sept. 10,

ME - $\beta \cdot \text{Edu}$ 2010

$$E_{du} = A_{OL} \cdot (m_e - \beta \cdot E_{du})$$

$$\frac{E_{du}}{m_e} = \frac{A_{OL}}{1 + \beta A_{OL}}$$

$$\frac{E_{du}}{m_e} = \frac{1}{\frac{\beta}{A_{OL}} + \frac{1}{A_{OL}}} = A_{OL}$$



$$V_{RMS}^2 = \frac{1}{T} \int_0^T v_o^2(t) dt = \frac{1}{T} \int_0^{T/2} V_p^2 \sin^2 2\pi f t dt$$

$$+ \frac{1}{T} \int_{T/2}^T 0 dt$$

2)

$$\frac{V_p^2}{T} \int_0^{T/2} (\sin^2 2\pi f t) dt,$$

$$\sin^2 x = \frac{1}{2}(1 - \cos 2x)$$

$$\frac{V_p^2}{2T} \int_0^{T/2} (1 - \cos \frac{4\pi t}{T}) dt \rightarrow dt = \frac{T}{4\pi} dx$$

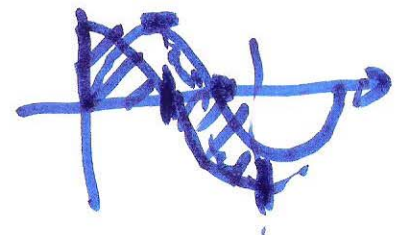
$$t=0, x=0$$

$$\text{let } x = \frac{4\pi}{T} t$$

$$t = \frac{T}{2}, x = 2\pi$$

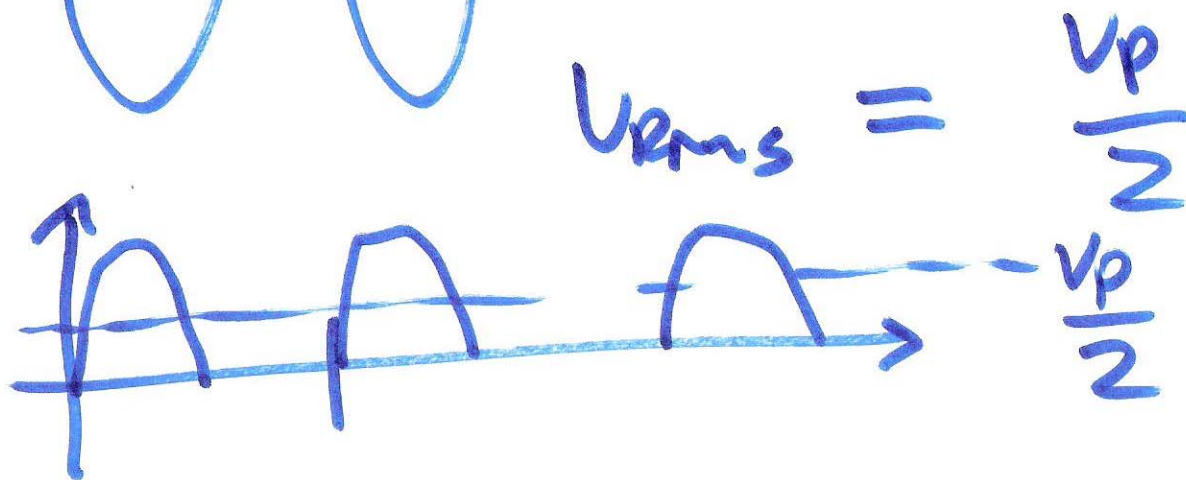
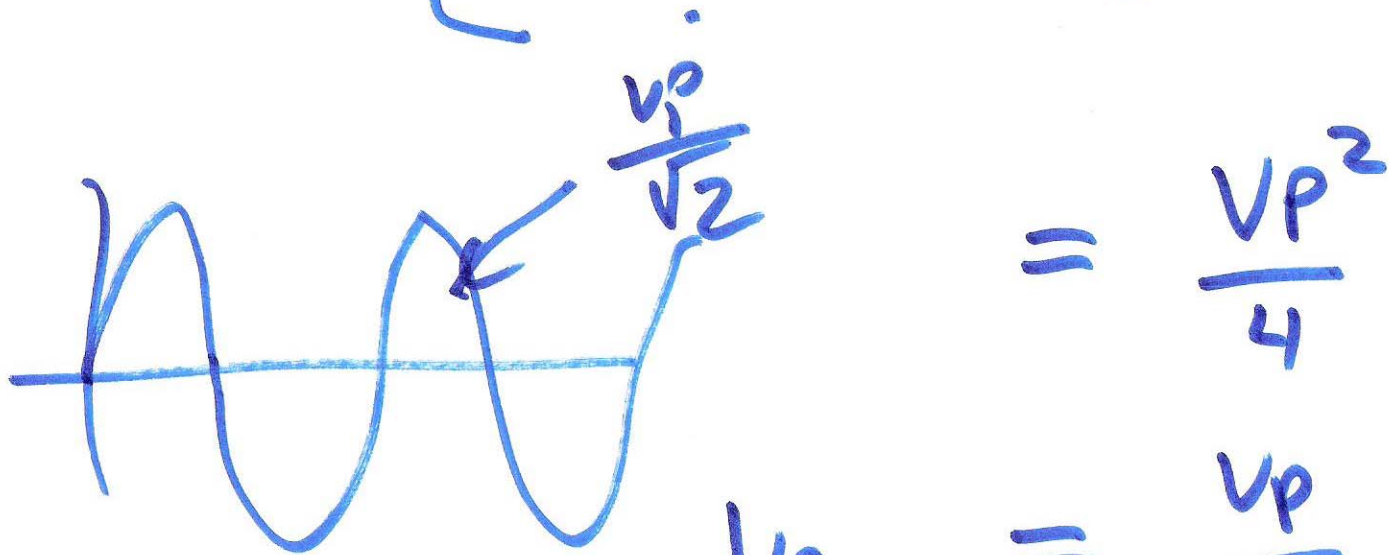
$$\frac{dx}{dt} = 4\pi f = \frac{4\pi}{T}$$

$$\frac{V_p^2}{8\pi} \int_0^{2\pi} (1 - \cos x) dx$$



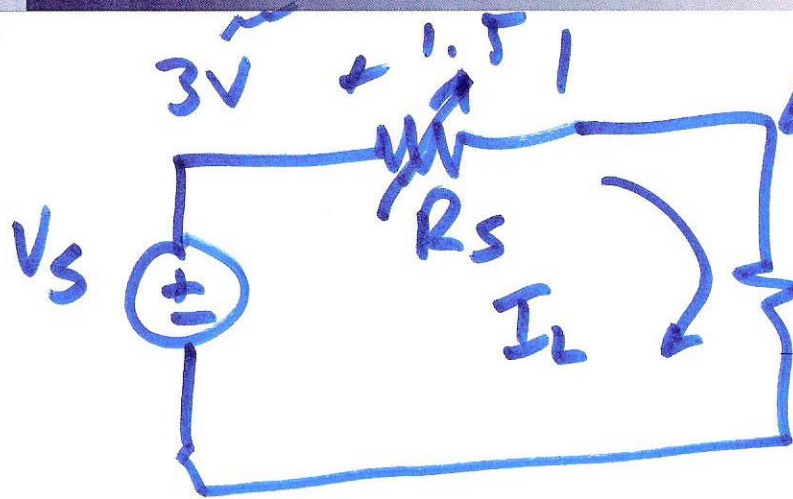
3)

$$V_{Rms}^2 = \frac{V_p^2}{8\pi} \left[x - \sin x \right]_0^{2\pi} = \frac{V_p^2}{8\pi} \left[2\pi - 0 - 0 + 0 \right]$$

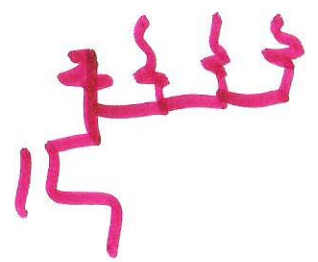


4)

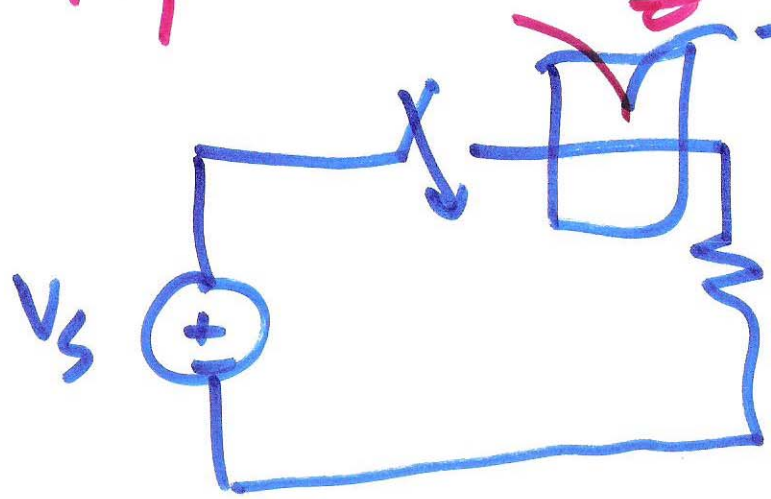
DC - DC converters



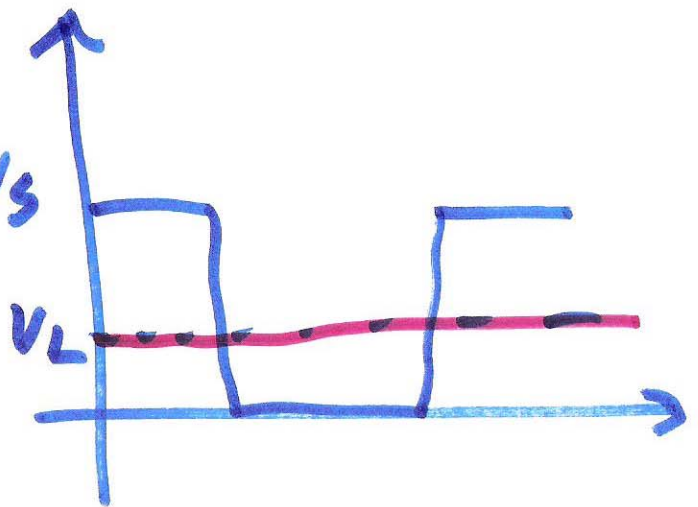
$$V_L = \frac{R_L}{R_L + R_s} \cdot V_s$$



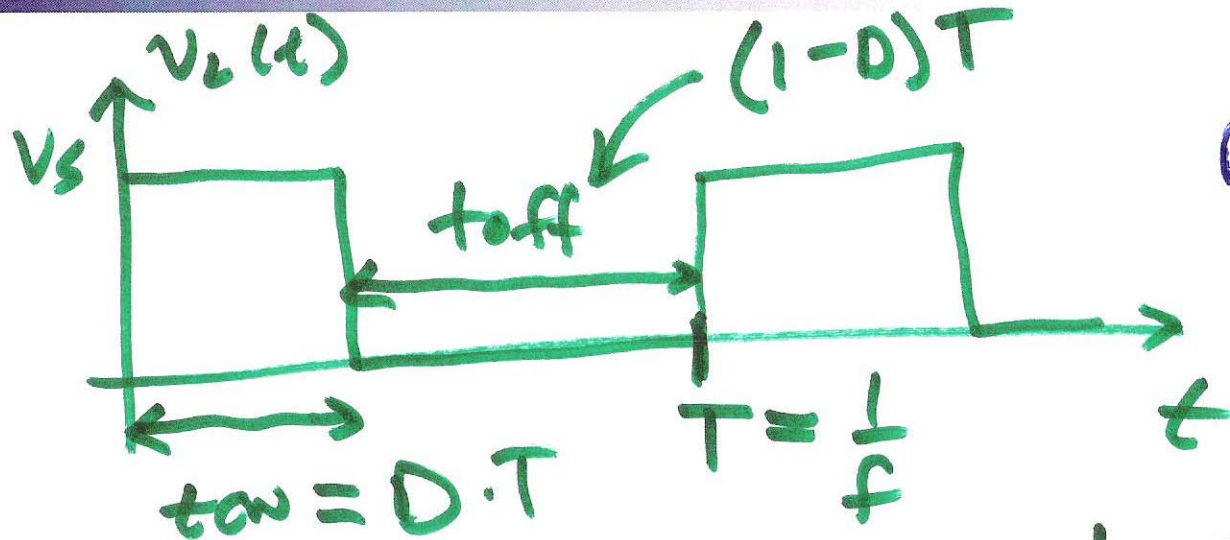
$$I_L = \frac{V_L}{R_L} = \frac{V_s}{R_s + R_L}$$



$$V_L = \frac{V_s}{2}$$



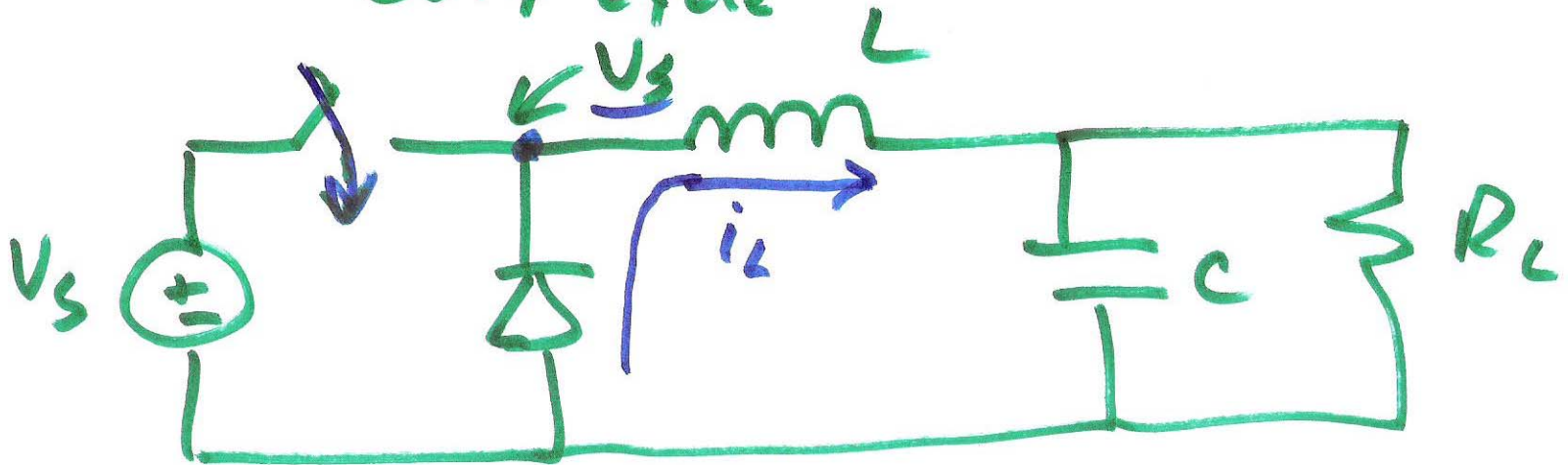
5)



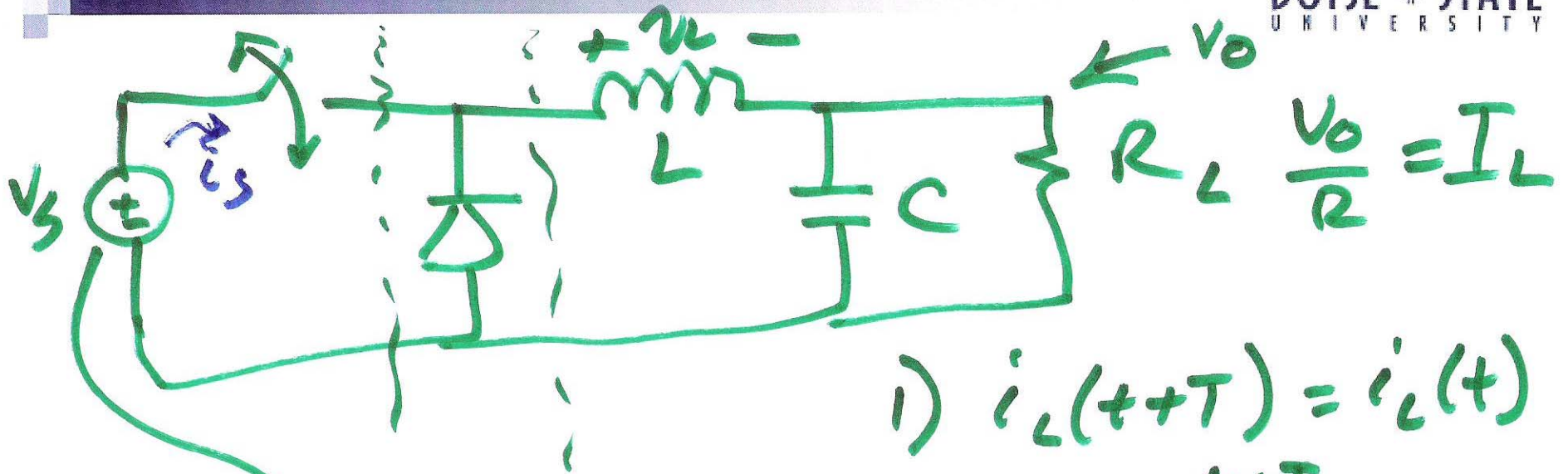
Buck \rightarrow D_{in}
 \rightarrow D_{out}
 Boost \uparrow

$$D = \frac{t_{on}}{t_{on} + t_{off}} = \frac{t_{on}}{T} = t_{on} \cdot f$$

$t_{on} + t_{off} = T$
 duty cycle



6)



$$1) i_L(t+T) = i_L(t)$$

$$2) v_L = \frac{1}{T} \int_0^{t+T} v_L(t) \cdot dt = 0$$

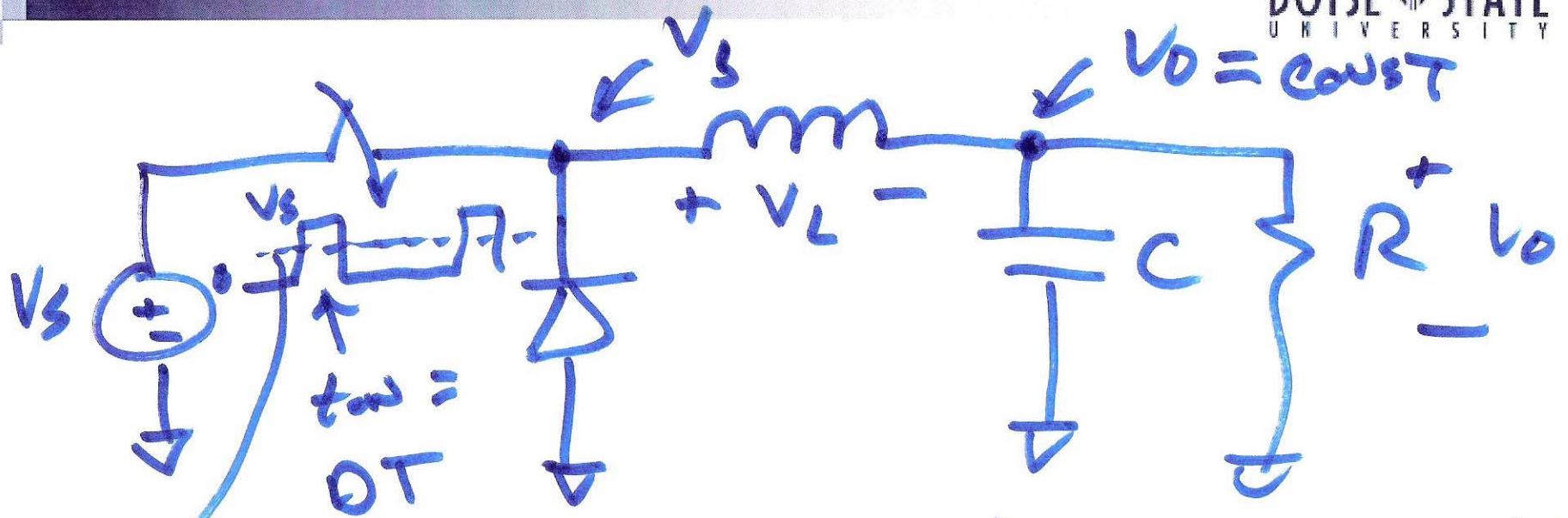
$$3) \int_{\phi}^{t+T} i_C(x) dx = 0$$

$$P_o = P_s$$

↑
Power
arrived
by
load

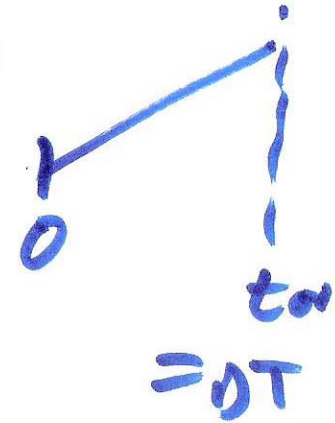
7)

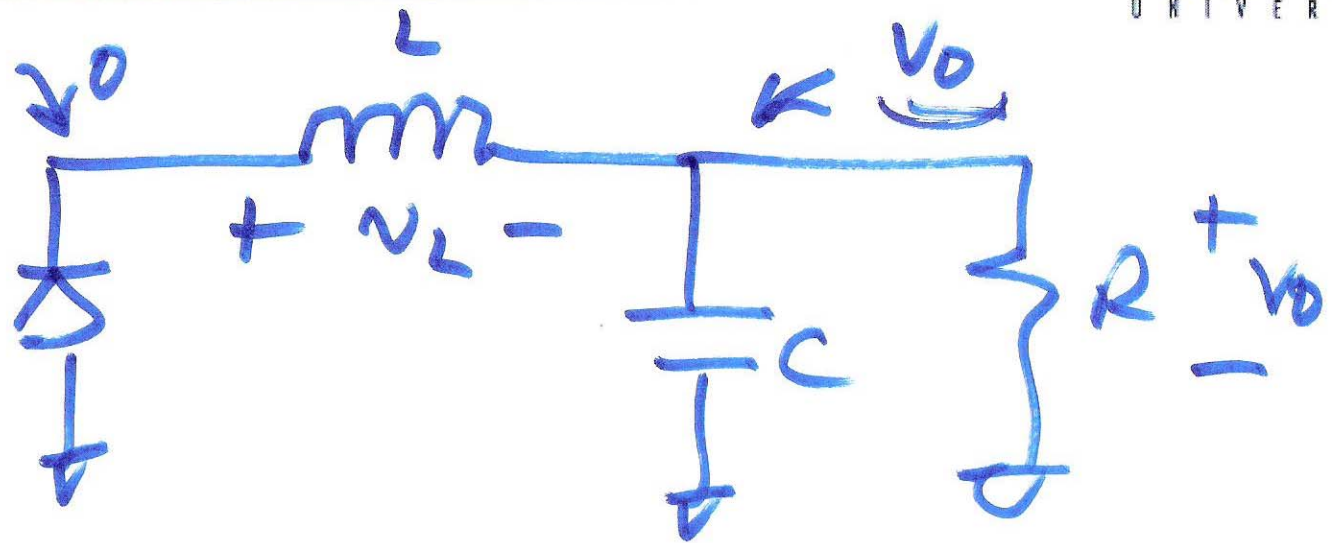
$$V_o = V_s \cdot D$$



$$V_L = V_s - V_o = L \cdot \frac{di_L}{dt} = L \cdot \frac{\Delta i_L}{\Delta t}$$

$$\Delta i_L = \frac{V_s - V_o}{L} \cdot DT$$

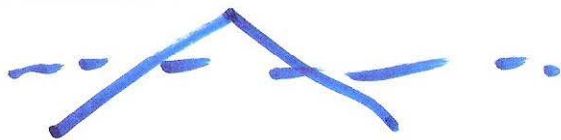




$$v_L = 0 - v_0 = L \cdot \frac{di_L}{dt} = L \cdot \frac{\Delta i_L}{(1-D) \cdot T}$$

$$\Delta i_{L_{off}} = \frac{-v_0}{L} \cdot (1-D)T$$

$$dt = \Delta t = t_{off} = (1-D)T$$



9)