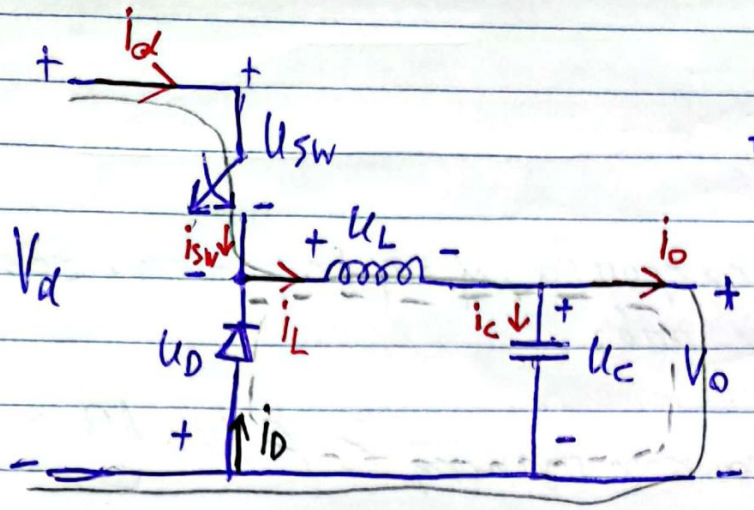
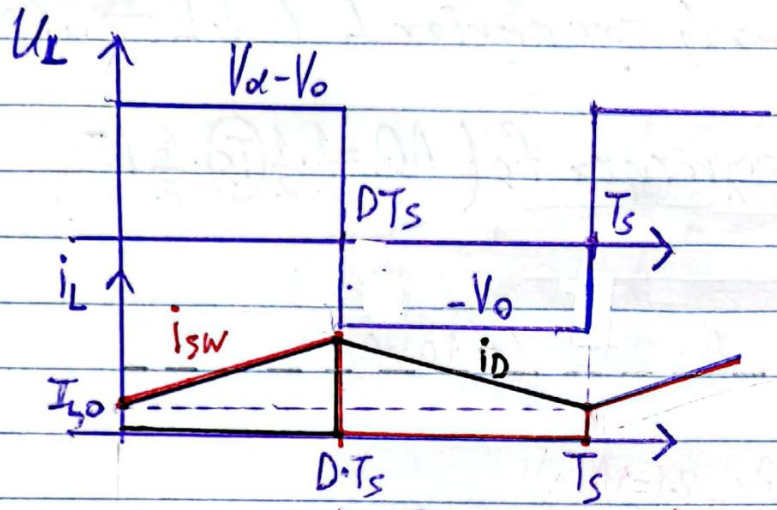


t_{ON}: $u_L = V_d - V_o$

t_{OFF}: $u_L = -V_o$

— : ON SW

- - - : OFF SW



$D < 1$

$u_L = L \frac{di}{dt}$

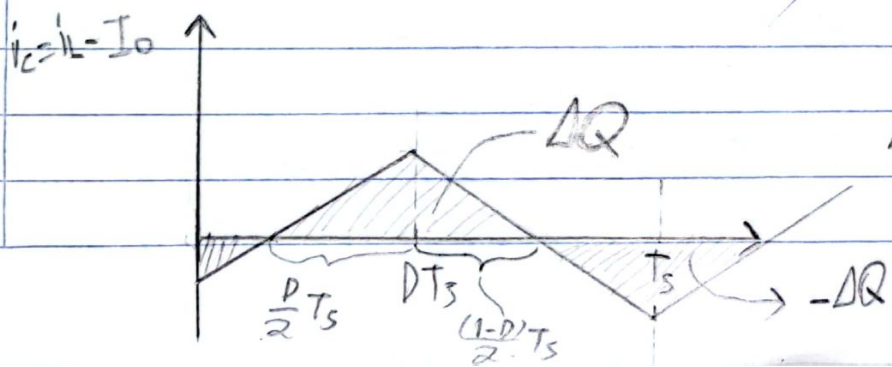
$I_L = I_o$

t_{ON}: $V_d - V_o = L \frac{\Delta I_L}{D \cdot T_S} \Rightarrow (V_d - V_o) D = \frac{L \Delta I_L}{T_S}$

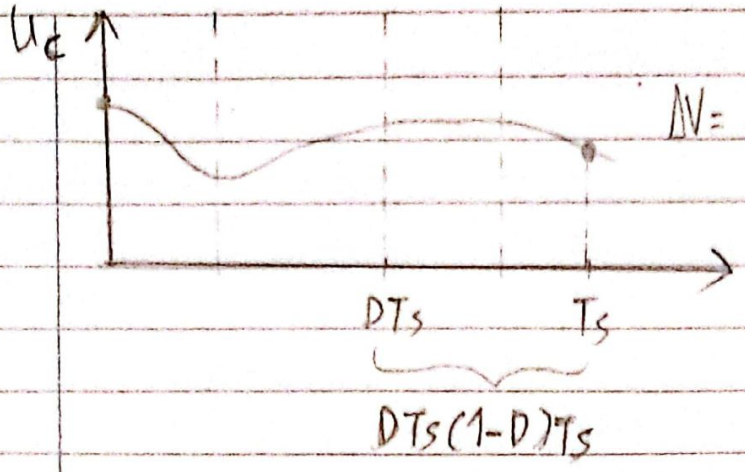
t_{OFF}: $-V_o = L \frac{-\Delta I_L}{(1-D) T_S} \Rightarrow V_o (1-D) = \frac{L \Delta I_L}{T_S}$

$\Rightarrow$

$\Rightarrow (V_d - V_o) \cdot D = V_o (1-D) \Rightarrow V_d D - V_o D = V_o - V_o D \Rightarrow \boxed{\frac{V_o}{V_d} = D}$



$\Delta Q = \frac{1}{2} \cdot \frac{1}{2} T_S \cdot \frac{\Delta I_L}{2} = \frac{T_S \cdot \Delta I_L}{8}$



• Σε έναν DC/DC μετατροπέα, η κυμάτωση της τάσης εξόδου επηρεάζεται από:

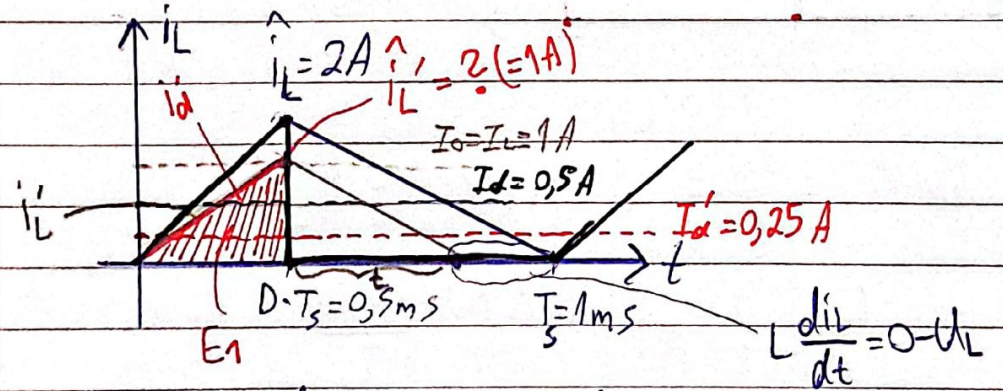
→ Τη χωρητικότητα του πυκνωτή C ($\Delta V = \frac{\Delta Q}{C}$)

→ Την αυτεπαγωγή του πηνίου L (↓L → ↑ κυμάτωση)

→ Τη διακοπτική συχνότητα f_s ($\Delta Q = \frac{1}{2}\cdot\frac{1}{2}\cdot(Ts)\cdot\frac{1}{2}\Delta I_L$)

$V_d = 40V$, $f_{sw} = 1kHz$, $D = 0,5$

$V_o = 20V$, $L = 5mH$, $P_o = 20W$ $(= 10W)$



$$u_L = L\frac{\Delta I_L}{\Delta t} \Rightarrow \Delta I_L = (V_d - V_o)\cdot\frac{1}{L}\cdot D\cdot T_s \quad (t_{ON})$$

$$\Delta I_L = (40V - 20V)\cdot\frac{1}{5\cdot 10^{-3}H}\cdot 0,5\cdot 10^{-3}s$$

$$\Delta I_L = 2A, \quad I_L = I_o = \frac{P_o}{V_o} = \frac{20W}{20V} = 1A$$

$$I_d = \frac{P_d}{V_d} \overset{\approx P_o}{=} 0{,}5A$$

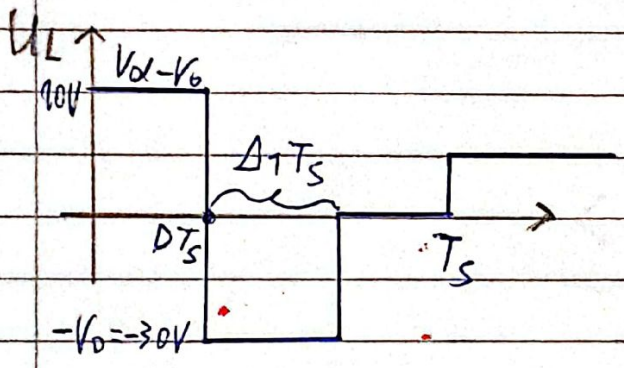
$$I_d = \frac{P_o'}{V_d} = \frac{10W}{40V} = 0{,}25\,A$$

$$E_1 = \frac{1}{2} D T_s \cdot \hat{i}_L', \quad I_d = \frac{E_1}{T_s} \Rightarrow I_d = \frac{1}{2} D \cancel{T_s} \cdot \frac{\hat{i}_L'}{\cancel{T_s}} \Rightarrow \hat{i}_L' = \frac{2I_d}{D} = \frac{2 \cdot 0{,}25A}{0{,}5} = 1A$$

$$\Delta I_L = \hat{i}_L' = \frac{V_d - V_o}{L} D T_s \Rightarrow V_d - V_o = \frac{L \cdot \hat{i}_L'}{D T_s} \Rightarrow V_o = 40V - \frac{5 \cdot 10^{-3} H \cdot 1A}{0{,}5 \cdot 10^{-3} s} = 30V$$

$$t_{off} : -V_o = L \cdot \frac{-\Delta I_L = -1A}{t} \Rightarrow t = 5 \cdot 10^{-3} H \frac{1A}{30V} = \frac{1}{6} \cdot 10^{-3} s = 0{,}167\,ms$$

$$-30V$$



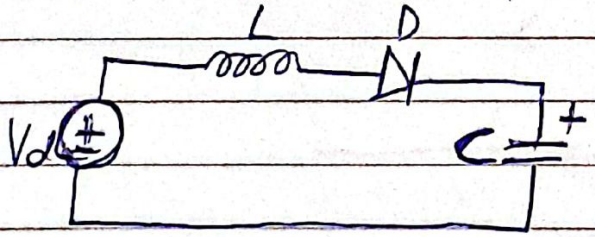
$$\frac{V_o}{V_d} = \frac{D}{D + \Delta_1} \text{ (για Κ.Α.Α.)}$$

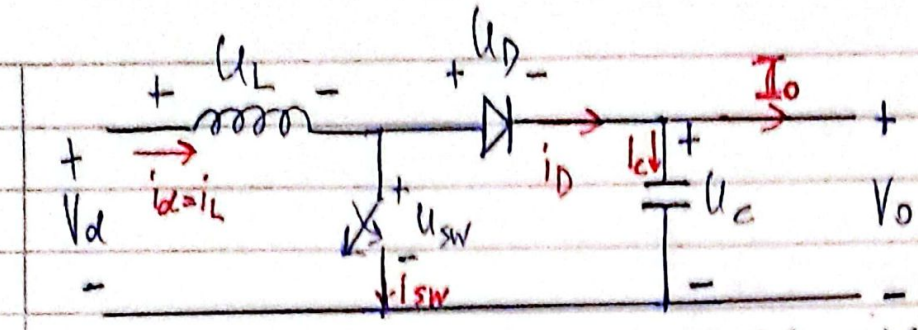
$$\frac{V_o}{V_d} = D \text{ (για Κ.Σ.Α.)}$$

Τάση εισόδου $V_d = 10V$, $L = 1mH$, $C = 0{,}1mF$

Α.Σ: $I_{L0} = 0A$ και $V_{C0} = 0V$

Η τάση του πυκνωτή στη μόνιμη κατάσταση = ? $(= 2V_d)$

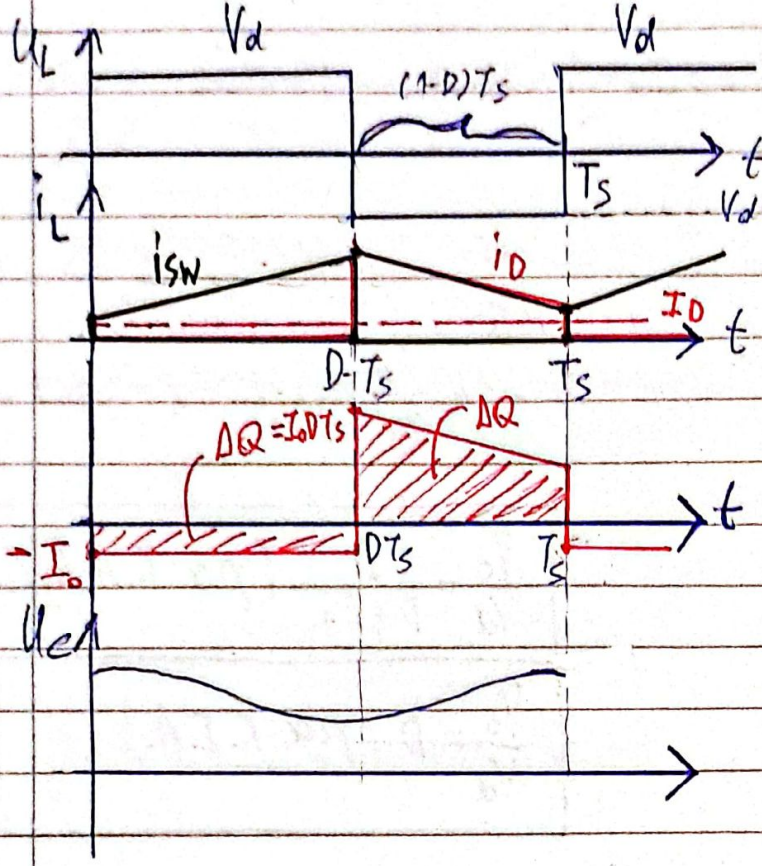




- $t_{ON}: u_L = V_d = L \cdot \Delta I_L / DT_S$
- $t_{OFF}: u_L = V_d - V_o =$

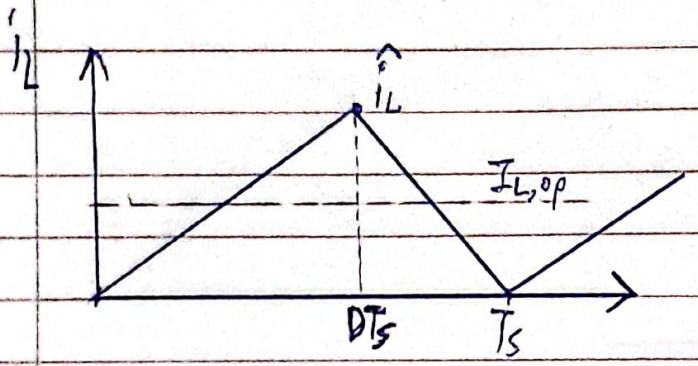
$= L \cdot \frac{-\Delta I_L}{(1-D)T_S} \Rightarrow$

$\Rightarrow (V_d - V_o)(D-1) = L \frac{\Delta I_L}{T_S}$



Άρα $V_d \cdot D = V_d \cdot D - V_d - V_o D + V_o$

$\Rightarrow V_d = V_o(1-D) \Rightarrow \boxed{\frac{V_o}{V_d} = \frac{1}{1-D}}$



Οριακή κατάσταση

Κ. ΣΑ - Κ.Α.Α.

$\hat{i}_L = 2 \cdot I_{L,op} = 2 I_{d,op}$

$u_L = L \frac{\Delta I_L}{\Delta t} = \frac{\hat{i}_L - 0}{D \cdot T_S} \Rightarrow \boxed{\hat{I}_{L,op} = \frac{V_d}{L} D \cdot T_S}$

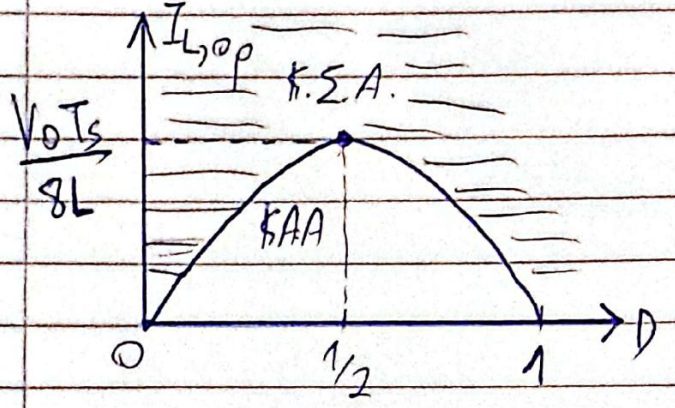
$\boxed{V_d = V_o(1-D)}$

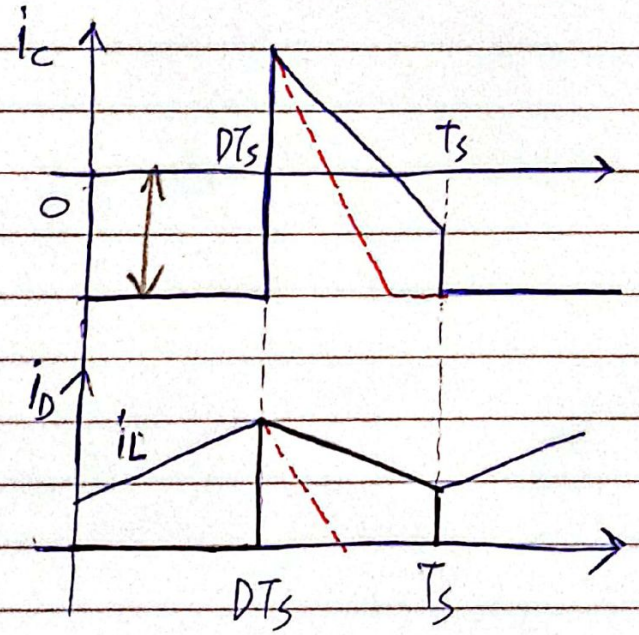
$I_{d,op} = I_{L,op} = \frac{1}{2} \frac{V_d \cdot T_S}{L} \cdot D = \frac{1}{2} \frac{V_o T_S}{L} D(1-D)$

Αν V_o: σταθερή

$$I_{L,op} = \frac{1}{2}\frac{V_o T_s}{L} D(1-D) \Rightarrow \boxed{I_{L,op}(D) = \frac{V_o T_s}{2L}(1-D)D}$$

$$\{D(1-D)\}_{max} = \frac{1}{4} \text{ για } D = \frac{1}{2}$$





ΚΣΑ

Κ.Α.Α (- - -)