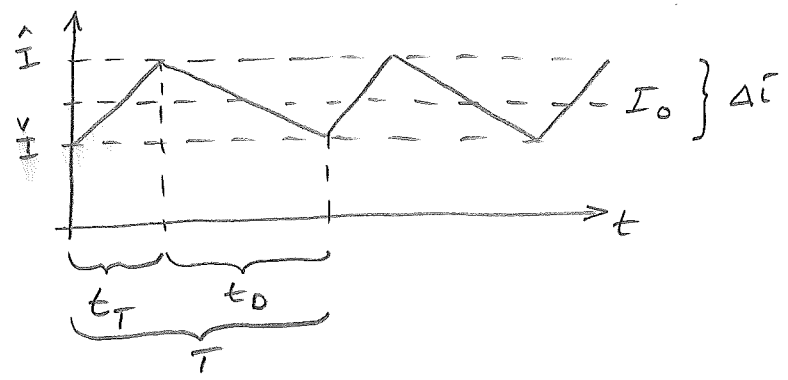
Uppgift 17.4



ANSLUTEN DRIFT (CCM)
STRÖMMEN NÅR ALDRIG NOLL $\Rightarrow t_T + t_D = T$

$$I_{RMS} = \sqrt{\frac{1}{T}\int_0^T i^2(t)\,dt} = \frac{1}{T}\left(\int_0^{t_T} i^2(t)\,dt + \int_{t_T}^{t_T+t_D} i^2(t)\,dt\right)$$

$$I_{RMS}^2 = \frac{1}{T}\left(\int_0^{t_T}\left(\check{I} + \frac{\Delta i}{t_T}\cdot t\right)^2 dt + \int_0^{t_D}\left(\hat{I} - \frac{\Delta i}{t_D}\cdot t\right)^2 dt\right) =$$

$$= \frac{1}{T}\left(\int_0^{t_T} \check{I}^2 + 2\check{I}\frac{\Delta i}{t_T}\cdot t + \left(\frac{\Delta i}{t_T}\right)^2 t^2\,dt + \right.$$

$$\left. + \int_0^{t_D} \hat{I}^2 - 2\hat{I}\,\frac{\Delta i}{t_D}\cdot t + \left(\frac{\Delta i}{t_T}\right)^2\cdot t^2\,dt\right) =$$

$$= \frac{1}{T}\left(\left[\check{I}^2 t + \check{I}\,\frac{\Delta i}{t_T}t^2 + \left(\frac{\Delta i}{t_T}\right)^2\cdot\frac{t^3}{3}\right]_0^{t_T} + \right.$$

$$\left. + \left[\hat{I}^2 t - \hat{I}\,\frac{\Delta i}{t_D}t^2 + \frac{\Delta i}{t_T}\cdot\frac{t^3}{3}\right]_0^{t_D}\right) =$$

$$= \frac{1}{T}\left(\check{I}^2 t_T + \check{I}\,\Delta i\, t_T + \frac{\Delta i^2}{3}t_T + \hat{I}^2 t_D - \hat{I}\,\Delta i\, t_D + \frac{\Delta i^2}{3}t_D\right) =$$

$$= \frac{1}{T}\left(\left(I_0 - \frac{\Delta i}{2}\right)^2 t_T + \left(I_0 - \frac{\Delta i}{2}\right)\Delta i\, t_T + \frac{\Delta i^2}{3}t_T + \right.$$

$$\left. + \left(I_0 + \frac{\Delta i}{2}\right)^2 t_D - \left(I_0 + \frac{\Delta i}{2}\right)\Delta i\, t_D + \frac{\Delta i^2}{3}t_D\right) =$$

$$= \frac{1}{T}\left(I_0^2 t_T - \cancel{I_0\,\Delta i\, t_T} + \frac{\Delta i^2}{4}t_T + \cancel{I_0\,\Delta i\, t_T} - \frac{\Delta i^2}{2}t_T + \frac{\Delta i^2}{3}t_D + \right.$$

$$\left. + I_0^2 t_D + \cancel{I_0\,\Delta i\, t_D} + \frac{\Delta i^2}{4}t_D - \cancel{I_0\,\Delta i\, t_D} - \frac{\Delta i^2}{2}t_D + \frac{\Delta i^2}{3}t_D\right) =$$

17.4 forts.

$$= \frac{1}{T}\left(I_0^2 (t_T + t_D) + \frac{3-6+4}{12} \Delta i^2 (t_T + t_D)\right) =$$

$$= \frac{t_T + t_D}{T}\left(I_0^2 + \frac{1}{12}\Delta i^2\right) = \left\{ CCM \Rightarrow \; t_T + t_D = T \right\}$$

$$= I_0^2 + \left(\frac{\Delta i}{2\sqrt{3}}\right)^2 \Rightarrow$$

$$I_{RMS} = \sqrt{I_0^2 + \left(\frac{\Delta i}{2\sqrt{3}}\right)^2} \Rightarrow$$

$$I_{RMS} = \sqrt{I_{DC,AVG}^2 + I_{AC,RMS}^2}$$

← DENNA ÄR BRA ATT KUNNA!

$$I_{AC,RMS} = \frac{\Delta i}{2\sqrt{3}}$$