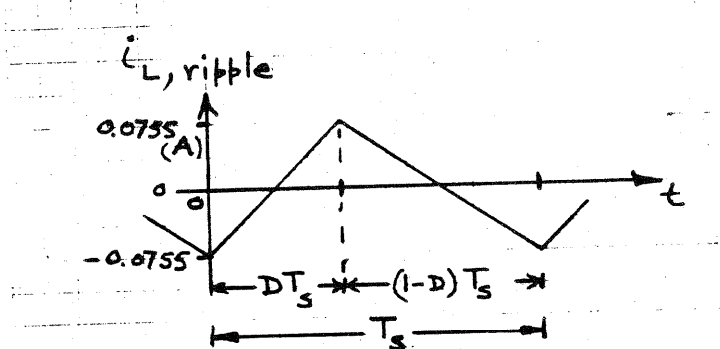


Problem 7-3

Find the RMS ripple current through L.



$$\text{Solution: } V = L \left[\frac{di_L}{dt} \right]; \text{ During } t_{on}, \frac{di_L}{dt} = \frac{12.6-5}{.001} = 7600 \text{ A/s}$$

During t_{off} , $\frac{di_L}{dt} = \frac{-5}{.001} = -5,000 \text{ A/s}$; $D = \frac{5}{12.6} = 0.397$. Therefore, the peak-to-peak ripple current is

$$\Delta i_L = 0.397(50\mu s)(7600 \text{ A/s}) = 0.151 \text{ A} \quad \text{Note: } T_s = 50 \mu s$$

$$i_{L, ripple}(t) = -0.0755 + 7600t \quad \text{for } 0 < t < 19.84 \mu s \quad \text{Note: } DT_s = 19.84 \mu s$$

$$= 0.1747 - 5000t \quad \text{for } 19.84 \mu s < t < 50 \mu s.$$

$$\sqrt{\frac{1}{T_s} \int_0^{T_s} [i_{L, ripple}]^2 \cdot dt} = I_{L, ripple, RMS}$$

$$\boxed{\text{RMS ripple current} = 43.66 \text{ mA}}$$