

Problem 7-13

$$V_d = 12V, V_o = 15V, I_o = 0.25A, L = 150\mu H, C = 470\mu F, f_s = 20kHz$$

From Eq. 7-47, (assume continuous conduction, $\therefore D = 0.556$)

$$I_{oB} = \frac{T_s V_o}{2L} (1-D)^2 = \frac{15 (1-0.556)^2}{2 \times 150 \times 10^{-6} \times 20 \times 10^3} = 0.493A,$$

$$R = \frac{V_o}{I_o} = 60\Omega$$

Since $I_o < I_{oB}$: Discontinuous Conduction Mode

Calculation for ΔV_o will require a new derivation: see Problem 7-15.

From Eq. 7-49,

$$I_{oB,max} = \frac{T_s V_o}{2L} = \frac{15}{2 \times 150 \times 10^{-6} \times 20 \times 10^3} = 2.5A$$

From Eq. 7-55,

$$D = \frac{V_o}{V_d} \sqrt{\frac{I_o}{I_{oB,max}}} = \frac{15}{12} \sqrt{\frac{0.25}{2.5}} = 0.395,$$

