

Problem 7-12

$$V_d = 8V-40V, V_o = 15V, f_s = 20 \text{ kHz}, C = 470 \mu F, P_o \geq 2W$$

$$I_o = \frac{P_o}{V_o} = \frac{2W}{15V} = 0.133A = I_{oB}$$

From Eq. 7-47,

$$I_{oB} = \frac{T_s V_o}{2L} (1-D)^2 \quad \therefore L_{\min} = \frac{T_s V_o}{2I_{oB}} (1-D)^2$$

Smallest D results in largest L_{\min}

$$\frac{D}{1-D} = \frac{V_o}{V_d} \quad ; \quad D = \frac{V_o}{V_o + V_d} \quad , \quad D(\text{smallest}) = \frac{15}{15 + 40} = 0.273$$

$$\therefore L_{\min} = \frac{15 (1-0.273)^2}{2 \times 0.133 \times 20,000} = 1.49 \text{ mH}$$