Problem 9-1

Using Eq. 9-3 in the circuit of Fig. 9-10b,

$$i_L(t) = I_{Lo}\cos\omega_o t + \frac{(\frac{V_d}{2} - V_o) - (-2V_o)}{Z_o}\sin\omega_o t$$

where $Z_o = \sqrt{\frac{L_r}{C_r}}$ and $I_{Lo} = 0.$

$$I_{L,peak} = i_L(\omega_o t = \frac{\pi}{2}) = \frac{\frac{V_d}{2} - V_o + 2V_o}{Z_o} = \frac{\frac{V_d}{2} + V_o}{Z_o}$$

From Eqs. 9-29 and 9-30 for a Half-bridge converter, $V_{base} = \frac{V_d}{2}$ and, $I_{base} = \frac{V_d/2}{Z_o}$. The normalized quantities are designated by the subscript N.

$$\therefore\ (I_{L,peak})_N = \frac{\frac{V_d}{2} + V_o}{Z_o} \bullet \frac{Z_o}{V_d/2} = 1 + (V_o)_N$$

Using Eq. 9-4 in the circuit of Fig. 9-10b,

$$v_c(t) = (\frac{V_d}{2} - V_o) - [(\frac{V_d}{2} - V_o) - (-2V_o)]\cos\omega_o t + Z_o I_{Lo}\sin\omega_o t$$

$$= (\frac{V_d}{2} - V_o) - (\frac{V_d}{2} + V_o)\cos\omega_o t \quad \text{since } I_{Lo} = 0$$

$$V_{c,peak} = v_c(\omega_o t = \pi) = (\frac{V_d}{2} - V_o) + (\frac{V_d}{2} + V_o) = V_d$$

$$\therefore\ (V_{c,peak})_N = 2$$