

18.42 In this problem we are asked to determine the magnetic field required to produce a Hall voltage of  $-3.5 \times 10^{-7}$  V, given that  $\sigma = 1.2 \times 10^7$   $(\Omega\text{-m})^{-1}$ ,  $\mu_e = 0.0050$   $\text{m}^2/\text{V}\cdot\text{s}$ ,  $I_x = 40$  A, and  $d = 35$  mm. Combining Equations 18.18 and 18.20b, and after solving for  $B_z$ , we get

$$B_z = \frac{|V_H| \sigma d}{I_x \mu_e}$$

$$= \frac{\left( |-3.5 \times 10^{-7} \text{ V}| \right) \left[ 1.2 \times 10^7 (\Omega\text{-m})^{-1} \right] (35 \times 10^{-3} \text{ m})}{(40 \text{ A})(0.0050 \text{ m}^2/\text{V}\cdot\text{s})}$$

$$= 0.74 \text{ tesla}$$