

- 4.11 Calculate E_{Fi} with respect to the center of the bandgap in silicon for $T = 200, 400,$ and 600 K.

From Table 4.1, $m_n^* = 1.08 m_0$ + $m_p^* = 0.56 m_0$
(assume constant wrt temperature)

$$(4.26b) \quad E_{Fi} - E_{midgap} = \frac{3}{4} k_B T \ln\left(\frac{m_p^*}{m_n^*}\right)$$

200K

$$E_{Fi} - E_{midgap} = \frac{3}{4} (8.617333 \times 10^{-5}) (200) \ln\left(\frac{0.56}{1.08}\right)$$

$$\underline{\underline{E_{Fi} - E_{midgap} = -0.0084895 \text{ eV}}}$$

400K

$$E_{Fi} - E_{midgap} = \frac{3}{4} (8.617333 \times 10^{-5}) (400) \ln\left(\frac{0.56}{1.08}\right)$$

$$\underline{\underline{E_{Fi} - E_{midgap} = -0.016979 \text{ eV}}}$$

600K

$$E_{Fi} - E_{midgap} = \frac{3}{4} (8.617333 \times 10^{-5}) (600) \ln\left(\frac{0.56}{1.08}\right)$$

$$\underline{\underline{E_{Fi} - E_{midgap} = -0.025469 \text{ eV}}}$$