

Consider a sample of InAs, which is a small band gap semiconductor. The material parameters are as follows:

$$E_G = 0.35 \text{ eV} = (E_C - E_V) \text{ at room temperature,}$$

$$N_C = 8.3 \times 10^{16} \text{ cm}^{-3} \text{ at room temperature,}$$

$$N_V = 1.7 \times 10^{19} \text{ cm}^{-3} \text{ at room temperature.}$$

The material is n-type, but partially compensated. The doping levels are:

$$N_D = 10^{16} \text{ cm}^{-3},$$

$$N_A = 8 \times 10^{15} \text{ cm}^{-3}.$$

The donor level (E_D) and acceptor level (E_A) are as follows:

$$E_D = E_C - 4 \text{ meV,}$$

$$E_A = E_V + 40 \text{ meV.}$$

(a) At what energy relative to either E_C or E_V is the equilibrium Fermi level at room temperature ($kT = 0.026 \text{ eV}$)? (3.0 pts)

(b) At what energy is the Fermi level at $T = 0$? (1.0 pt)