Problems

1. Consider a gold-GaAs Schottky diode with a capacitance of 1 pF at -1 V. What is the doping density of the GaAs? Also calculate the depletion layer width at zero bias and the field at the surface of the semiconductor at -10 V bias voltage. The area of the diode is 10^{-5} cm^2.

2. Using the work functions listed in table 3.2.1, predict which metal-semiconductor junctions are expected to be ohmic contacts. Use the ideal interface model.

3. Design a platinum-silicon diode with a capacitance of 1 pF and a maximum electric field less than 10^4 V/cm at -10 V bias. Provide a possible doping density and area. Make sure the diode has an area between 10^{-5} and 10^{-7} cm^2. Is it possible to satisfy all requirements if the doping density equals 10^{17} cm^{-3}?

4. A platinum-silicon diode (area $= 10^{-4}$ cm^2, $N_d = 10^{17}$ cm^{-3}) is part of an LC tuning circuit containing a 100 nH inductance. The applied voltage must be less than 5 V. What is the tuning range of the circuit? The resonant frequency equals $n = \dfrac{1}{2p\sqrt{LC}}$, where L is the inductance and C is the diode capacitance.