

Solid state physics

Problems 4

Deadline: 15. November 2020. 24:00

- 1) Derive the density of states for one-dimensional and two-dimensional free electrons.
- 2) If you know the bandstructure of a semiconductor, then how you can determine the value of electron and hole mass?
- 3) What are the advantages of doping?
- 4) Sketch the number of electrons in conduction band versus temperature function for a n-doped semiconductor.
- 5) A two-dimensional free electron in perpendicular weak magnetic field B moves along a circular trajectory. Using Lorentz-force calculate the angular frequency of the motion. What is the radius of the circle, if the kinetic energy of the electron is E ?
- 6) Last time we talked about the differential form of Ohm's law, $j = \sigma E$. Is this form valid for Hall-conductivity? How can we generalize it?
- 7) According to Eq. 7.13 calculate the cyclotron mass for a two-dimensional free electron in perpendicular magnetic field.
- 8) What is the energy of electronic states living on the cylinder walls in Fig. 7.2?