ETH
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Solid State Theory
Exercise 12

FS 15
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Problem 12.1 Cyclotron mass

For electrons near a band minimum the dispersion has the form

$$\varepsilon(\vec{k}) = \text{const} + M_{\alpha\beta} k_\alpha k_\beta.$$

Diagonalizing this matrix, calculate the cyclotron effective mass for the main symmetry directions of the magnetic field. Compare it with the effective mass for the specific heat in the same geometry.

Problem 12.2 Magnetoresistance in the two-band model

Consider a metal with two types of carriers. Each of these bands has its own longitudinal and Hall resistivity. Calculate the magnetoresistance and the Hall effect when both types of carriers contribute.