Answer on Question # 75150, Physics -Electric Circuits:

Question: How one can determine the effective mass from the hall resistance in a constant temperature and different magnetic field? And how is it possible to find the g-factor from hall resistance?

Solution: We know hall resistance R = $\frac{h}{e^2}$, where h= Planck's constant and e = electron charge.

Again effective mass $m^* = \frac{\mathrm{h}^2}{4\pi^2(\frac{\mathrm{d}^2\mathrm{E}}{\mathrm{dk}^2})}$ .....(1)

Put the value of h from hall resistance in equation (1), we get, $m^* = \frac{\mathrm{R}^2\mathrm{e}^4}{4\pi^2(\frac{\mathrm{d}^2\mathrm{E}}{\mathrm{dk}^2})}$

Polarised field $B = (\frac{\mathrm{h}^2}{2\pi.\mu_\mathrm{B}})(\frac{\mathrm{n}}{\mathrm{m}^*\mathrm{g}})$ .....(2), where g = g-factor, μ_B = Bohr magneton, n = n th state, m^* = effective mass.

Now equation (2) can be written in the form g = $(\frac{h^2}{2\pi.\mu_B})(\frac{n}{m^*B}) = (\frac{R^2e^4}{2\pi.\mu_B})(\frac{n}{m^*B})$

where ,R is the hall resistance.

Answer: $m^* = \frac{\mathrm{R}^2\mathrm{e}^4}{4\pi^2(\frac{\mathrm{d}^2\mathrm{E}}{\mathrm{dk}^2})}$ and g = $(\frac{R^2e^4}{2\pi.\mu_B})(\frac{n}{m^*B})$