PYL321/EPL 335

Minor 1

1. Show graphically the energy spectrum (distribution of energy levels) for an electron confined by (a) finite square potential well (b) parabolic potential well and (c) triangular potential well. (5)

2. Compare the energy levels and wavefunctions of an electron confine to infinite deep potential with and without a uniform electric field. (4)

3. (a) Show graphically the density of states function (DOS) for a two dimensional electron gas. (b) Also plot the DOS when magnetic field is applied perpendicular to the plane of the 2DEG at ultralow temperatures. (c) What is quantum Hall effect? (d) Show that in QHE, the Hall conductance σ_H is integral multiple of e^2/h. (5)

4. (a) For a 2DEG some of the physical quantites such as magnetization, conductivity, specific heat etc. shows oscillatory begavior with magnetic field. Expalin the reason. Why are Landau levels observed only at low temperature and high magnetic field. Write down the Hamiltonian for 2DEG under magnetic field with vector potential A = (-By, 0,0) and show it will be like harmonic oscillator.
(6)