CHAPTER 7

CONCLUSIONS

The following problems have been investigated in the present work based on the Yang and Laughlin's Hamiltonians. The Yang potential is solved in the complex plain by using the complex $\delta(x_i-x_j)$ and the Bethe's Ansatz wave function. We find that the Laughlin's wave function gives the ground state energy with the Coulomb's Hamiltonian which is 91 per cent of the Wigner value. Hence strictly speaking it is not the ground state of the Coulomb's Hamiltonian. An effort is made to find the Hamiltonian for which the Laughlin's wave function is the ground state. In that case it is the ground state of the potential of the type $\nabla^2\delta(r_i-r_j)$ but the ground state energy is zero. The fractional charges are arising due to the use of flux quantization and hence fractions are not built in the wave function. It is found that hydrogen type wave functions with proper L, S and J for a single particle are good enough for explaining the quantum Hall effect data. An effort is made to find the relationship between the Laughlin's wave function and the angular momentum. It is found that the angular momenta in the Laughlin's wave function are not defined in terms of L, S and J. In fact there is no spin at all. It is assumed that the levels can be first calculated and the filling can be done by taking the spin into account. Hence spin is missing in the wave function. It is found that a second wave function can be generated from the Laughlin's first wave function by taking a projection. Hence a third wave function can be generated from the first two. In this way a series of wave functions can be generated. The quantum Hall effect is described in terms of L, S and J. A wave function corresponding to L, S and J can be multiplied by the Laughlin's wave function to generate a third wave function. A series of wave functions can be generated.

Kohn's theorem was originally suggested for low temperatures. Indeed the theorem is well obeyed at low temperatures. An analysis of a Hubbard model for a system of three points has been studied.

On the whole, the Laughlin's wave function proves to be a good tool for the study of problems in condensed matter physics.