2. What is meant by single particle tunneling? Explain what is meant by flux quantization and hence find an expression of fluxoid. Explain the formation of cooper pairs according to BCS theory. (2+5+3)

3. Explain the origin of spin wave. Find the dispersion relation of spin wave assuming a linear lattice. Derive Bloch $T^{3/2}$ law. (2+5+3)

4. What is magnetic resonance? Explain the mechanism of electron spin resonance in a solid. What is meant by spin-spin interaction? (2+5+3)

5. Find an expression of coherence length in a superconductor. How do you classify type-I and type-II superconductor on this basis. In what type of superconductor the surface energy is positive? Explain the origin of positive surface energy in detail. (4+2+1+3)

6. (a) Obtain the spin dependent Hamiltonian according to Heisenberg exchange interaction. (5)

(b) Show that spontaneous magnetization decreases with the increase of temperature of a ferromagnetic material on the basis of Weiss molecular field theory. (5)

……………………………………………

(Internal Assessment – 10)

2018

M.Sc.

4th Semester Examination

PHYSICS

PAPER – PGS-404

Full Marks : 50

Time : 2 Hours

The figures in the right hand margin indicate full marks.
Candidates are required to give their answers in their own words
as far as practicable.
Answer Q1 and any three from the rest

(Solid State Physics-Spl-II)

1. Answer any five bits: 5 X 2 = 10

(i) Prove that superconductivity state is more ordered state than normal state at $T<T_c$.

(ii) Find the spectroscopic notation effective number of Bohr magneton for Cr^{2+} having $3d^4$ electrons in the outermost shell.

(iii) What is the physical significance of coherence length?

(iv) What do you mean by cooper pair?

(v) What do you mean by indirect and super exchange interaction?

(vi) What is EPR?

(vii) Show the schematic spin arrangement in ferrous ferrite and calculate the net moment per unit cell.

(viii) Explain why Pauli's spin paramagnetism is independent of temperature.

(Turn Over)