

2017

M.Sc.

4<sup>th</sup> 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) Explain what is meant by Magnon?
- (ii) Prove that entropy in superconducting state is lower than normal state.
- (iii) Find the Hund's ground state for  $Mn^{2+}$  having  $3d^5$  electron configuration.
- (iv) Explain what is meant by Quenching of orbital angular momentum.
- (v) What is the full form of SQUID and what is its use?
- (vi) What is the physical origin of a domain in a ferromagnetic solid?
- (vii) Find the schematic spin arrangement in Ferrous Ferrite. Why the ferrite is technically important solid?
- (viii) Explain why a pure ionic crystal do not show ESR but it shows for ionic crystal containing F center.

***(Turn Over)***

2. (a) What is meant by flux quantization in a superconducting ring? (2)  
(b) Find an expression of Fluxoid in this connection. (6)  
(c) What is meant by persistence of current in a superconductor? (2)
3. (a) Find the effective number of Bohr magneton in case of wide multiplets of a paramagnetic material. (6)  
(b) State the meaning of narrow multiplet in case of paramagnetic system. (2)  
(c) What is meant by Domain rotation? (2)
4. (a) What are the assumptions in molecular field theory of antiferromagnetism? (2)  
(b) Deduce an expression of susceptibility of antiferromagnetic solid in the temperature range in which the sub lattices are far from magnetic saturation. (5)  
(c) Find an expression of Neel temperature in this connection. (3)
5. (a) Derive an expression for exchange integral assuming Heitler London scheme of a ferromagnetic solid. (8)  
(b) Explain why Fe, Ni, Co are ferromagnetic but Mn and Cr are nonferromagnetic. (2)
6. (a) Establish two Ginzburg London (GL) equations from GL free energy functional of superconductivity. (4)  
(b) Find the expression of critical current density from BCS theory. (4)

.....*Continued*

- (c) Do Cooper pairs obey uncertainty relation? - Explain your reasoning. (2)

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**(Internal Assessment – 10 )**