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PG CBCS
M.Sc. Semester-IV Examination, 2021
PHYSICS
PAPER: PHS 404A
(**SOLID STATE PHYSICS II**)

Full Marks: 40 **Time: 2 Hours**

Answer any <u>FOUR</u> questions from the following: **4×10=40**

1. Briefly describe BCS theory of superconductivity. 10
2. What do you mean by energy gap of a superconductor? 3
   From the free energy consideration explain the occurrence of type I and type II superconductivity. 7
3. What do you mean by coherence length and penetration depth? 3
   Derive the expression of penetration depth from London theory. 3
   Derive an expression for critical current density in a superconductor. 4
4. Write short notes on: i. Flux quantization, ii. Magnetic levitation, iii. Persistant current. 6
   State some application of superconductors. 4
5. Explain what is meant by quenching of orbital angular momentum in a magnetic solid? 2
   Prove that superconducting state is more ordered sate than normal state. 3
   What is meant by Cooper pair? 2
   Discuss Hund's rule. 3
6. Considering a linear chain of spins, find the dispersion relation for a spin wave excited on the chain. 6
   Derive Bloch's $T^{3/2}$ law. 2
   What is magnon? 2
7. What do you mean by magnetic resonance? 2
   Briefly describe the mechanism of NMR spectroscopy. 8
8. Explain exchange interaction in a ferromagnetic solid and find an expression of exchange interaction energy. 10

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