

- (ii) Distinguish between ferromagnetic magnons and antiferromagnetic magnons.
5. (i) Explain the BCS theory of Superconductors and explain the existence of energy gap among superconductors on the basis of BCS theory.
    - (ii) Discuss the flux quantization in a superconducting ring.
  6. (i) State and derive AC Josephson effect in superconductors.
    - (ii) Discuss the origin of Meissner effect in superconductors.
  7. (i) Compare the optical properties of metals and non-metals.
    - (ii) Write a short note on exciton absorption and free carrier absorption.
  8. (i) How the optical transitions take place in direct and indirect band gap materials ?
    - (ii) Discuss the optical properties of thallium activated alkali halides.

**Exam. Code : 209004**  
**Subject Code: 4899**

**M.Sc. Physics 4<sup>th</sup> Semester**  
**CONDENSED MATTER PHYSICS-II**  
**Paper - Phy-552**

Time Allowed—2 Hours] [Maximum Marks—100

**Note :—** There are **Eight** questions of equal marks. Candidates are required to attempt any **Four** questions.

1. (i) How the cooling can be produced by adiabatic demagnetisation ? Also, write the minimum value of temperature that can be achieved with this method.
  - (ii) Why paramagnetic materials are used for producing low temperatures using process of adiabatic demagnetisation ?
2. (i) Explain the Gouy method to find the value of magnetic susceptibility of magnetic materials.
  - (ii) Compare the results of Classical and Quantum theory of Paramagnetism.
3. (i) Explain the temperature dependence of spontaneous magnetization.
  - (ii) Give comparison between the superexchange interaction and exchange interaction.
4. (i) Discuss the formation of Bloch wall and find an expression for energy associated with it.