Q.P. Code – 56934

Final M.Sc. Degree Examination

OCTOBER/NOVEMBER 2014

(Directorate of Distance Education)

Physics

(DPB 540) Paper VIII – SOLID STATE PHYSICS – II

Time : 3 Hours] *[Max. Marks : 75/85*

Instructions to Candidates :

1) *Answer any **FIVE** questions from Parts **A**, **B** and **C** without omitting any Part.*

2) *Part **D** is **compulsory** for those who appear for paper with maximum marks 85.*

PART – A

1. (a) Deduce the Bloch $T^{3/2}$ law and explain its validity.

   (b) Discuss neutron diffraction in magnetic structure determination. **7 + 8**

2. (a) Discuss Neel's theory of ferrimagnetism.

   (b) Explain saturation magnetization in ferromagnetic materials. **10 + 5**

3. (a) With suitable theory, explain the variation of specific heat, and susceptibility in liquid ^3He.

   (b) Explain the origin of superfluidity in liquid ^4He and liquid ^3He. **10 + 5**

PART – B

4. (a) Write a note on Fermi energy and discuss the variation of Fermi energy with temperature and impurity density in case of impurity semiconductor.

   (b) Explain the variation of electrical conductivity with respect to band gap in case of impurity semiconductor.

   (c) Write a note on the role of acceptor and donor level in extrinsic semiconductor. **6 + 6 + 3**

5. (a) What is Hall effect? Deduce an expression for Hall coefficient for an intrinsic semiconductor.

   (b) Discuss Magneto-resistance phenomenon. **10 + 5**

6. (a) Deduce Einstein equation.

   (b) Obtain an expression for diffusion length under excess carrier conditions in a semiconductor. **5 + 10**

PART – C

7. (a) Obtain an expression for drift velocity under high electric field transport.

   (b) Explain the working of Tunnel and Zener diodes and mention their applications. **7 + 8**

8. (a) Discuss photovoltaic devices for solar cell applications.

   (b) Write a note on luminescence and mention its applications. **9 + 6**

9. (a) Briefly explain the BCS theory of superconductivity.

   (b) Show that the magnetic flux through a superconducting ring is quantized. **9 + 6**

PART – D

10. Answer any **TWO** of the following : **2 × 5 = 10**

    (a) Write a note on High T_c superconductors.

    (b) What is Gunn effect?

    (c) Explain the principles of ESR.