GOVT BRENNEN COLLEGE CENTRAL LIBRARY THALASSERY

M 25140

Reg. No. : .....

Name : .....

II Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.) Examination, March 2014

PHYSICS

PH 203 : Solid State Physics

Time : 3 Hours Max. Marks : 50

Instructions : *Section **A** : Answer **any two** questions. **Each** carry **ten** marks.*
*Section **B** : Answer **any five** questions. **Each** carry **three** marks.*
*Section **C** : Answer **any three** questions. **Each** carry **five** marks.*

SECTION – A

1. Discuss the salient features of Debye's theory of specific heat and show how far it agrees with the experimental values.
2. Discuss dc and ac Josephson's effects and explain their importance.
3. Describe Langevin's theory for a paramagentic gas and its limitations. Obtain paramagnetic susceptibility of a free electron gas employing quantum statistics.
4. Obtain an expression for the carrier density of an intrinsic semiconductor. Explain how the resistivity of an intrinsic semiconductor varies with temperature. **(2×10=20)**

SECTION – B

5. What is flux quantization ?
6. Discuss Hall effect.
7. What is Weidmann-Franz-Lorentz law ?
8. What is Curie-Weiss law in ferromagnetism ?

P.T.O.

9. Show that the reciprocal lattice for a simple cubic structure is also simple cubic .

10. What is effective mass in semiconductors ?

11. Write a note on atomic force microscopy.

12. Write a note on carbon nano tubes. **(5×3=15)**

SECTION – C

13. What is Hall effect ? Mention the main uses of Hall effect.

14. Determine the temperature at which the electronic and ionic heat capacities of copper are equal. The Debye temperature of Copper is 345 K and Fermi energy is 7 eV.

15. The London penetration depths for Pb at 3 K and 7.1 K are respectively 39.6 nm and 173 nm. Calculate its transition temperature as well as penetration depth at 0 K.

16. The Hall voltage for the metal sodium is 0.001 mV, measured at I = 100 mA, B = 2 weber/m^2 and width of specimen = 0.05 mm. Calculate the number of carriers per cubic metre in sodium.

17. Determine the magnetic moment per ion for a sample of iron given that the magnetization of iron is 17.1×10^5 JT^{-1} m^{-3}. The density of iron is 7.87×10^3 kgm^{-3} and the molar mass of iron is 0.056 $kgmol^{-1}$ (Assume iron consists of Fe^{2+} ions only and each have six 3 d electrons). **(3×5=15)**
