M 27344

Reg. No. : .....

Name : .....

Second Semester M.A./M.Sc./M.Com. Degree (Regular/Supplementary/ Improvement) Examination, March 2015
(2013 and Earlier Admn.)
PHYSICS
PH203 : Solid State Physics

Time : 3 Hours Max. Marks : 50

PART – A

Answer **any two** questions. **Each** question carries **10** marks.

1. Describe Langevin's theory for a paramagnetic gas and give its limitation. How does paramagnetic susceptibility vary with temperature ?
2. Discuss electrical conductivity of metals on the basis of quantum mechanical considerations. Compare this expression for electrical conductivity with the classical one.
3. Derive the equation for the conductivity of an intrinsic semiconductor in terms of carrier concentration and carrier mobilities.
4. Explain the BCS theory of superconductivity and discuss the energy gap based on this theory. **(2×10=20)**

PART – B

Answer **any five** questions. **Each** question carries **3** marks.

1. Explain the concept of reciprocal lattice.
2. What are the drawbacks of classical free electron theory ?
3. Explain hall effect. Give an application.
4. Mention three important applications of superconducting materials.
5. Explain what is meant by ferromagnetic domains.

P.T.O.

6. What is nano technology ?

7. What do you mean by quantum dots ?

8. How does X-ray diffraction method help in the study of structural characterization of nano materials ? **(5×3=15)**

PART – C

Answer **any three** questions. **Each** question carries **5** marks.

1. How are nano tubes synthesized ?

2. Electrons are accelerated by 345 volt and are reflected from a crystal. The first reflection maximum occurs when the glancing angle is 60 degrees. Calculate the spacing of the crystal.

3. The angle of reflection of neutron beam from a crystal interplanar spacing is 3.84A° is 30 degrees. Calculate the speed of neutrons.

4. Calculate the London penetration depth λ_0 at OK for lead of density 11300 kg/m^3 and atomic weight 207.19. If T_C = 7.22 K, calculate the increase in λ at 3.61 K.

5. A magnetic material has a magnetization of 3300 ampere/meter and flux density of 0.0044 Wb/m^2. Calculate the magnetizing field and the relative permeability of the material. **(3×5=15)**
