 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **PHYSICS**

THIRD SEMESTER – NOVEMBER 2012

# PH 3810 - SOLID STATE PHYSICS - I

Date : 01/11/2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**PART – A**

Answer **ALL** questions: (10x2=20)

1. In a cubic unit cell, find the angle between normals to the planes (111) and (121)
2. What is the difference between neutron diffraction and electron diffraction?
3. Define density of phonon state.
4. List the major contributions to the specific heat capacity.
5. What do you understand by free electron gas.
6. Write down the expression for the electronic contribution to specific heat capacity.
7. Why a solid whose energy bands are filled cannot be a metal?
8. Explain the concept of forbidden bands.
9. Define Fermi surface.
10. Explain electron and hole orbits.

**PART – B**

Answer any **FOUR** questions: (4x7.5=30)

1. Derive Laue’s equations for diffraction of X-rays in a crystal lattice.
2. Derive the w-k dispersion relationship for a one dimensional monoatomic lattice
3. Write a note on Fermi-Dirac statistics and explain the effect of temperature on Fermi-Dirac statistics
4. State and prove Bloch’s theorem.
5. Discuss any one experimental method of Fermi surface study.

**PART – C**

Answer any **FOUR** questions : (4x12.5=50)

1. Discuss in detail with diagram Laue and powder method of determining crystal structure
2. Discuss the Debye model of lattice specific heat capacity. Explain how this model is able to account for low temperature and high temperature behaviour.
3. Explain the concept of density of available electron states in three dimensions. Obtain the expressions for the Ef0 and average kinetic energy.
4. Explain how the formation of bands in the Kronig-Penny model may be accounted for.
5. Discuss the theory of effect of electric field on the Fermi surface.

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