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Total Number of Pages : 01

M.Sc.I  
FPYC603

6<sup>th</sup> Semester Regular / Back Examination 2018-19

SOLID STATE PHYSICS

BRANCH : M.Sc.I(AP)

Time : 3 Hours

Max Marks : 70

Q.CODE : F288

Answer Question No.1 which is compulsory and any five from the rest.  
The figures in the right hand margin indicate marks.

- Q1 Answer the following questions :** (2 x 10)
- a) What are Miller indices?
  - b) What are symmetry operations? Name the different types of symmetry elements.
  - c) Why X-rays are used for the analysis of crystal structure?
  - d) What are Brillouin zones?
  - e) What are covalent crystals? Give an example.
  - f) What is cohesive energy in solids?
  - g) What do you mean by density of states?
  - h) What is a phonon?
  - i) How the specific heat varies with temperature of a superconductor?
  - j) Distinguish between perfect conductor and superconductor.
- Q2**
- a) Obtain Laue's equations for X-ray diffraction by crystals. Show that these are consistent with the Bragg's law. (6)
  - b) X-rays of wavelength  $0.71 \text{ \AA}$  are reflected from the (1 1 0)-plane of a rock salt crystal of lattice constant  $a = 2.82 \text{ \AA}$ . Calculate the corresponding glancing angle for second order reflection. (4)
- Q3**
- a) Explain Drude-Lorentz theory of electrical conduction. (5)
  - b) Explain Fermi-Dirac distribution of electron gas. (5)
- Q4**
- a) How do you explain cohesion in inert gas crystals? Using semi quantitative arguments obtain dependence of the van der Waals' interaction. (5)
  - b) Discuss about the hydrogen bonded crystals. Is hydrogen bond direction or non-directional? (5)
- Q5**
- a) Discuss the experimental survey of superconductivity in detail. (5)
  - b) Distinguish between Type-I and Type-II superconductors. (5)
- Q6** Derive an expression for binding energy for an ionic crystal and obtain the expression for the Madelung constant. Evaluate the Madelung constant for linear ionic crystal. (10)
- Q7** Derive vibrational modes of a diatomic linear lattice. Discuss the different branches of the dispersion relation curve. (10)
- Q8 Write short answer on any TWO :** (5 x 2)
- a) Geometrical Structure Factor
  - b) Dynamics of monoatomic chains
  - c) Meissner's Effect