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R—107—2017

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2017

(Old Course)

PHYSICS

Paper XIII

(Solid State Physics)

(Saturday, 8-4-2017) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) *All* questions carry equal marks.

1. Attempt any *four* : 8

(*a*) Define primitive and non-primitive unit cell.

(*b*) Draw the diagrams of four distinct crystal systems in a two-dimensional lattice.

(*c*) Define specific heat.

(*d*) State Dulong and Petit's law.

(*e*) State Wiedemann-Franz relation.

(*f*) Enlist any *four* outstanding properties of metals on the basis Drude-Lorentz theory.

(*g*) Define intrinsic and extrinsic semi-conductors.

2. Attempt any *two* : 8

(*a*) What are different types of symmetry operations ? Show that five fold rotational symmetry as not permissible.

(*b*) State the important assumptions of classical theory of specific heat. Derive an enpression for specific heat using classical theory of specific heat.

(*c*) Describe Drude-Lorentz theory.

P.T.O.

3. Attempt any *two* : 8

(*a*) Derive an expression for electrical conductivity of metals.

(*b*) Explain the difference between conductors, insulators and semi-conductors.

(*c*) Describe the limitations of Debye's model of lattice heat capacity.

4. Attempt any *one* : 8

(*a*) Derive an expression for the lattice heat capacity of solid using Einstein's model. Discuss the assumptions and predictions of this model and compare with experimental observations.

(*b*) Derive an expression for the density of electrons in the conduction band for N-type semiconductor.

5. Write short notes on any *two* : 8

(*a*) Acceptor and donor levels

(*b*) Thermal conductivity

(*c*) Specific heat of solids

(*d*) Three-dimensional Bravais lattices.