15073

M.Sc. DEGREE EXAMINATION, NOVEMBER 2016.

FIRST SEMESTER

Physics

Paper III – SOLID STATE PHYSICS

Time : Three hours Maximum : 75 marks

(No additional sheet will be supplied)

PART A — (5 × 3 = 15 marks)

Answer any FIVE questions.

Each question carries 3 marks.

Each answer should not exceed 1 page.

1. Explain chemical bonding, in ionic crystals.
2. What are phonons and explain its properties?
3. State and explain Matthiessen's rule.
4. Distinguish between metals, semiconductors and insulators.
5. Write a note on direct and indirect band gap semiconductors.
6. What is Hall effect and explain its importance in semiconductors?
7. State and explain isotopic effect.
8. Write a note on SQUIDS.

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. (a) What are van der Waals crystals? Derive the expression for lattice energy in van der waals crystals.

   (b) Write a note on elastic moduli.

Or

10. (a) What are lattice vibrations and obtain dispersion relation for mono atomic lattice.

    (b) Explain infrared absorption in ionic crystals.

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11. (a) Obtain the relation between electrical and thermal conductivities.

(b) Formulate Roltzmann transport equation.

Or

12. (a) What are the consequences of Somerfield model?

(b) Explain the motion of electron in a periodic potential.

13. (a) What are extrinsic semiconductors and derive an expression for coneentration of electrons in extrinsic semiconductors?

(b) Explain the variation of Fermi level with temperature.

Or

14. (a) Explain the generation, recombination and life time of non-equilibrium carriers.

(b) Explain Hayness-Shockley experiment.

15. (a) Derive London's equations and determine the penetration depth.

(b) Briefly explain specific heat behaviour.

Or

16. (a) Briefly explain the BCS theory of superconductivity.

(b) Briefly mention the applications of superconductors.

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