NOVEMBER/DECEMBER 2019

MPH42 — CONDENSED MATTER PHYSICS

Time : Three hours Maximum 75 marks

SECTION A — (5 × 6 = 30 marks)

Answer ALL questions.

1. (a) Describe the crystal structure of hcp.

Or

(b) Find the reciprocal lattice of bcc lattice.

2. (a) Derive dispersion relation for a one dimensional monoatomic lattice.

Or

(b) Discuss the inelastic scattering of photons by phonons.

3. (a) Explain Weidmann-Franz law.

Or

(b) Discuss the variation of carrier concentration with temperature in semiconductors.

4. (a) Discuss adiabatic demagnetization in paramagnetic salts.

Or

(b) Explain the existence of ferromagnetic domains.

5. (a) Describe the isotope effect in superconductors.

Or

(b) Discuss the various applications of SQUID.

SECTION B — (3 × 15 = 45 marks)

Answer any THREE questions.

6. Obtain the general expression for the atomic structure factor using spherical polar coordinates, Also, derive the relation connecting atomic structure factor and geometric structure factor.

7. Discribe the Debye's model of specific heat with its salient features.

8. Explain the Kronig-Penney model for the motion of an electron in a periodic potential.

9. Explain the distribution of 3d electrons in iron atom using Hund's rules and the quenching of orbital angular momentum in a crystal.

10. Derive the London equations for superconductors.

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