15132

M.Sc. DEGREE EXAMINATION, OCTOBER/NOVEMBER 2019.

FIRST SEMESTER

Material Science and Nanotechnology

Paper II — CONCEPTS IN MATERIALS SCIENCE

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. Define unit cell and Bravais lattice.

2. Discuss different symmetry operations.

3. Write the production of color centres.

4. Write the role of dislocations in crystal growth.

5. Write inelastic scattering of phonons by neutrons and discuss umklapp process.

6. Write the properties of phonons.

7. Write the formation of energy bands.

8. Explain the classification of metals, insulators and semiconductors based on hand theory.

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. What are Miller indices. Explain the identification of crystal planes in crystals.

Or

10. What is packing fraction. Calculate the packing fraction to hexagonal closed packed and simple cubic structures.

11. Obtain an expression for equilibrium concentration of Schottky and Frenkel in crystals

Or

12. Discuss Screw and edge dislocations. Write about staucking faults and grain boundaries.

13. Derive the expression for dispersion relation of one dimensional mono atomic infinite lattice Obtain the expression for normal modes of finite lattice.

Or

14. Obtain the dispersion relation in one dimensional infinite diatomic lattice.

15. Define a Bloch function. Discuss the motion of electron in a periodic potentials.

Or

16. Obtain the expression for effective mass of electron. Draw the E versus k diagram in extended and reduced zone schemes.

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