15132

M.Sc. DEGREE EXAMINATION, NOVEMBER 2017.

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. Explain the terms Unit cell, Bravais lattice and lattice constant.

2. Explain the structure of NaCl.

3. Write a note on colour centres.

4. Discuss the role of dislocations in crystal growth.

5. What is phonon and explain its characteristics?

6. Write a note on normal models of vibrations in a finite lattice.

7. Write a note Bloch function.

8. Explain the concept of effective mass.

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. Distinguish between coordination number and No. of atoms per unit cell. Find the coordination numbers in simple cubic and face centred cubic lattice.

Or

10. Define Miller indices. Find the Miller indices of a plane that makes an intercept of a, 2b and 3c along the crystallographic axis. (a, b and c are the primitive vectors of the lattice).

11. What are point defects? Derive the expression for Schottky defects in NaCl.

Or

12. Distinguish between edge and screw dislocations. Derive an expression for strain energy in screw dislocation.

13. Derive the dispersion relation in monoatomic lattice.

Or

14. Discuss the scattering of phonons by neutrons and photons.

15. Discuss the motion of electron in a periodic potential using Kroning penny model.

Or

16. Explain various schemes of representation of E vs K curves. Distinguish between metals, semiconductors and insulators.
