

45074- A

M.Sc. DEGREE EXAMINATION, MARCH/APRIL 2020

FOURTH SEMESTER

Physics

Paper IV – CONDENSED MATTER PHYSICS - II

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. State and explain Hooke's law and elastic behaviour of solid.
2. Obtain Cauchy's relations in normal and extensional strains.
3. What is a phonon and discuss its properties?
4. Write the inelastic scattering of neutrons by phonons.
5. What is a Bloch function and write its importance.
6. Discuss how the anharmonicity explains the thermal expansion.
7. Write the elements present in STM techniques and their functioning.
8. Distinguish between quantum wells, wires and dots.

PART B — (4 × 15 = 60 marks)

Answer ALL Questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. (a) Obtain the expression for elastic energy density and discuss its relation to potential of elastic forces.
- (b) Discuss how the elastic constants are reduced from 36 to 21 in most asymmetric crystals.

Or

10. (a) Obtain the expression for elastic wave velocity along [110] direction when a wave is propagating along XY plane and particle displacement also XY plane.
(b) With block diagram explain the determination of elastic constants by pulse-echo method
11. (a) Discuss the Einstein theory of specific heat.
(b) Write the drawbacks of this theory.

Or

12. Obtain the expression for Gruneisen parameter using elementary Kinetic theory.
13. (a) Discuss the motion of electron in one dimensional periodic potential.
(b) Construct Brillouin zone for simple cubic in periodic zone scheme.

14. (a) Write the different methods used in the Fermi surface studies.
(b) Discuss the study of Fermi surface by Anomalous skin effect.
15. (a) Explain the inert gas condensation method in synthesis of nano particles.
(b) Explain the growth of nano particles by sol gel method.

Or

16. (a) Discuss the principle and instrumentation of AFM technique to determine the particle size of nano materials.
(b) Write the applications of nano materials in medicine.