

2022
M.Sc.
Third Semester
DISCIPLINE SPECIFIC ELECTIVE – 01
PHYSICS
Course Code: MPHD 3.11 (A)
(Condensed Matter Physics – II)

Total Mark: 70
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

UNIT-I

1. What are lattice imperfections? How do they effect the properties of solids? Calculate the energy required for the formation of vacancy. Find an expression for the number of vacancies at a given temperature. 2+2+8+2=14
2. Discuss edge dislocation and screw dislocation. Calculate the dislocation of energy of an elastic isotropic crystal. 6+8=14

UNIT-II

3. Derive the London equation and discuss how it helps in explaining the superconducting state. A superconducting tin has a critical temperature of 3.7 K at zero magnetic field and a critical field of 0.0306 T at 0 K. What is the critical field at 2 K? 12+2=14
4. Discuss Josephson effect. Give formulation of DC and AC Josephson effects. 4+10=14

UNIT-III

5. Explain the two main techniques used for the production of nanotechnology. What are the different physical properties of nanomaterials? Write a short note on quantum dots? 4+6+4=14

6. Discuss the magnetic behaviour of nanomaterials with special reference to superparamagnetism. What are the applications of magnetic nanoparticles? 12+2=14

UNIT-IV

7. Write in details about nucleation and growth of nanomaterials. Explain the various physical vapour deposition (PVD) method. 12+2=14
8. Explain the electrical and optical properties of semiconductor thin films. 14

UNIT-V

9. Explain sol-gel method for the synthesis of nanomaterials. What are the advantages of sol-gel process? Explain spin-coating method for the deposition of thin films. 5+2+7=14
10. Discuss in detail about scanning electron microscope (SEM) and transmission electron microscope (TEM). 7+7=14
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