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Reg. No. : .....

Name : .....

Fourth Semester M.Sc. Degree Examination, July 2024

Physics

PH 241 : CONDENSED MATTER PHYSICS

(2020 Admission Onwards)

Time : 3 Hours Max. Marks : 75

PART – A

Answer any **five** questions. Each question carries **3** marks.

1. Explain Hall effect.
2. What is Kronig-Penney model?
3. Is the superconducting transition is reversible? Explain by using the term 'critical temperature' TC.
4. Based on Meissner effect, differentiate type I and type II superconductors.
5. Write a short note on Brillouin zones.
6. Explain Fermi surface.
7. Explain electrical conductivity of metals.
8. What is polymorphism?

(5 × 3 = 15 Marks)

P.T.O.

PART – B

Answer **all** questions. Each question carries **15** marks.

9. (a) Derive Bragg's law of X-ray diffraction in crystals.

   (b) Discuss the principle behind the different X-ray diffraction methods.

OR

10. (a) Explain thermal resistance of solids.

    (b) Explain Einestein's model of specific heat of solids.

11. (a) Explain hall effect in semiconductors.

    (b) Briefly explain semiconductor function properties.

OR

12. (a) Explain antiferro magnetism.

    (b) Discuss ferro magnetic domain.

13. (a) Explain AC and DC Josephsm effect.

    (b) Explain BCS theory effect superconductor.

OR

14. (a) Discuss deffent sputtering techniques.

    (b) Explain pulsed laser deposition.

(3 × 15 = 45 Marks)

PART – C

Answer any **three** questions. Each question carries **5** marks.

15. The density of state of electron in a metal is given by $D(E) = 13.6 \times 10^{27} E^{1/2} dE$ and $\rho = 8.5 \times 10^{28} / m^3$. What is the energy of Fermi level?

16. Give Fermi-Dirac distribution function. Using the same find out the heat capacity of electrons.

17. For lead the superconductivity occurs at temperature 27.19 K when there is zero applied magnetic field. When the magnetic field 0.074 T is applied at temperature 2.0 K superconductivity will stop. Find the magnetic field that should be applied so that superconductivity will not occur at any temperature.

18. Discuss the working principle of TEM.

19. In the X-ray diffraction of a set of crystal planes having d equal to 0.18 nm, first order reflection is found to be at an angle of 22°. Find the wavelength of the X-ray.

20. A material crystallized in fcc phase has a density of 6250 kgm^{-3} and molecular mass 60.2 amu. What is its lattice constant?

(3 × 5 = 15 Marks)