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Reg. No. : .....

Name : .....

Fourth Semester M.Sc. Degree Examination, June 2022

Physics

PH : 241 : CONDENSED MATTER PHYSICS

(2020 Admission)

Time : 3 Hours Max. Marks : 75

PART – A

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

1. Explain the concept of reciprocal lattice.
2. Discuss Normal and Umklapp process.
3. Explain Hall effect.
4. Discuss the temperature dependence on the mobility of charge in semiconductors.
5. Write a short note on effective mass of an electron.
6. Explain ferromagnetic domains.
7. Explain flux quantization in superconductor.
8. Write a short note on sol-gel technique.

(5 × 3 = 15 Marks)

P.T.O.

PART – B

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

9. Discuss three scattering mechanisms responsible for the thermal resistance of solids.

OR

10. Discuss Kroning Penny model of band theory and its inferences.

11. Discuss (a) Hall effect in semiconductors and (b) Electrical conductivity of semiconductors.

OR

12. Explain (a) ferroelectricity and derive curie Weiss Law (b) ferromagnetic domains.

13. Explain BCS theory of superconductivity and flux quantization.

OR

14. Discuss (a) Sol-gel technique (b) molecular beam epitaxy.

(3 × 15 = 45 Marks)

PART – C

Answer any **three** of the following questions. Each question carries **5** marks.

15. Copper has an atomic weight 63.5, the density 8.9×10^3 kg/m^3 $v_t = 2.32 \times 10^3$ and $v_1 = 4.76 \times 10^3$ Estimate Debye temperature and specific heat at 30 K

16. Show that five-fold rotation axis is not compatible with a lattice.

17. The intrinsic carrier density at 300 K in silicon is $1.5 \times 10^{16}/m^3$. If the electron and hole mobilities are 0.13 and 0.05 $m^2 V^{-1} s^{-1}$ respectively. Calculate the conductivity of (a) intrinsic silicon and (b) silicon containing 1 donor impurity atom per 10^8 silicon atom.

18. The magnetic intensity in a piece of ferric oxide is 10^6 A/m. If the susceptibility of the material at room temperature is 1.5×10^{-3}, Calculate the flux density and magnetization of the material.

19. A superconducting lead has a critical temperature of 7.26 K at zero magnetic field and the critical field of 8.5×10^5 A/m at 0 K. Find the critical field at 5K.

20. Discuss the working principle of SEM.

(3 × 5 = 15 Marks)
