

Reg. No. :

Name :

Third Semester M.Sc. Degree Examination, June 2022

Physics with Specialization in Nano Science

Space Physics

PHSP 533/PHNS 533 : CONDENSED MATTER PHYSICS

(2020 Admission)

Time : 3 Hours

Max. Marks : 75

PART – A

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

1. Explain Schotky, Frenkel and Compositional defects.
2. Discuss Normal and Umklapp process.
3. Explain Wiedemann Franz Lorentz law.
4. Write a short note on electrical conductivity of extrinsic semiconductors.
5. Write clausius mosotti equation and explain the term polarazability.
6. What is ferromagnetism and explain hysteresis loop of ferromagnetic materials.
7. Explain flux quantization in superconductor.
8. Briefly explain how AFM can be used for biological samples.

(5 × 3 = 15 Marks)

P.T.O.



PART – B

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

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

OR

10. Discuss nearly free electron model of solids.

11. Explain

- (a) Langevin theory of paramagnetism and
- (b) Quantum theory of paramagnetism.

OR

12. Discuss

- (a) Hall effect in semiconductor and
- (b) Electric conductivity of intrinsic semiconductor.

13. Discuss

- (a) London equation
- (b) penetration depth and
- (c) Coherence length in superconductor.

OR

14. What do you mean by electron microscopy and explain the working of SEM.

(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 $8.9 \times 10^3 \text{ kg/m}^3$, $v_t = 2.32 \times 10^3$ and $v_l = 4.76 \times 10^3$. Estimate Debye temperature and specific heat at 30 K.
16. Show that the reciprocal lattice of BCC is face centered.
17. Find the total polarizability of CO_2 , if its susceptibility is 0.985×10^{-3} . Density of CO_2 is 1.977 nKg/m^3 .
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. The penetration depth of mercury at 3.5 K is about 75 nm. Estimate the penetration depth at 0K. Also calculate superconducting electron density.
20. Discuss Sol gel technique for the nanomaterial preparation.

(3 × 5 = 15 Marks)

