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Reg. No. : .....

Name : .....

Fourth Semester M.Sc. Degree Examination, June 2025

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. Write a brief note on unit cell.
2. Define Dulong-Petit law.
3. What are Miller indices?
4. Differentiate between semiconductors and insulators.
5. What are free carriers?
6. Give a short note on dipole moment.
7. Differentiate between Type I and Type II superconductors
8. Discuss the importance of XRD.

(5 × 3 = 15 Marks)

P.T.O.

PART – B

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

9. Write a detailed view on the following
   (a) Imperfections in crystal
   (b) Polymorphism in crystal.

OR

10. Give a detailed account on the following
   (a) Einstein model of specific heat
   (b) Debye model of specific heat.

11. Comment on the Peizo, Pyro and Ferro electric properties of crystals.

OR

12. Write about the
   (a) Semiconductor junction properties
   (b) Hall effect in semiconductors.

13. Discuss on critical temperature, critical current and critical magnetic field of superconductors.

OR

14. Explain in detail
   (a) Preparation techniques used in nanoscience and technology
   (b) Characterization of nanomaterials.

(3 × 15 = 45 Marks)

PART – C

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

15. Find the interplanar spacing of cubic crystal whose miller indices was found to be [1 1 1].

16. Calculate the Miller indices of crystal planes which cut through the crystal axes at (a, b, c), (2a, b, c) and (2a, –3b, –3c).

17. Express the effect of temperature on Fermi distribution.

18. Comment on the notion of mobility of charge carriers.

19. Two positive unit charges are separated by distance 'a' which are collinear, with origin at centre of two charges. Find the dipole moment of the configuration.

20. Distinguish between SEM and TEM characterization techniques.

(3 × 5 = 15 Marks)