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J – 4865

Reg. No. : .....

Name : .....

Fourth Semester M.Sc. Degree Examination, May 2020

Physics

PH : 241 — CONDENSED MATTER PHYSICS

(2018 Admission)

Time : 3 Hours

Max. Marks : 75

PART – A

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

- I. (a) Explain the concept of Reciprocal lattice.
- (b) Define phonon and phonon momentum.
- (c) Explain Fermi surface.
- (d) Discuss the donor level in thermal equilibrium of semiconductors.
- (e) Explain bravais lattices.
- (f) Explain ferromagnetic domains.
- (g) What do you meant by critical current.
- (h) Write a short note on SEM.

(5 × 3 = 15 Marks)

P.T.O.



PART – B

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

- II. (a) Discuss debye theory of specific heat.

OR

- (b) Explain the motion of electron in a one dimensional periodic potential.

- III. (a) Discuss :

- (i) Hall effect in semiconductors and  
(ii) Electrical conductivity of semiconductors.

OR

- (b) Discuss different polarization mechanisms and derive Clausius- Mosotti relation.

- IV. (a) Discuss ac and dc Josephson effect.

OR

- (b) Derive London equations in superconductivity.

**(3 x 15 = 45 Marks)**

PART – C

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

- V. (a) Explain Brillouin zone.

- (b) Explain thermal conductivity of metals and Wiedemann-Franz law.

- (c) The intrinsic carrier density at room temperature is Ge is  $2.37 \times 10^{19} \text{ m}^{-3}$ . If the electron and hole mobilities are 0.5 and 0.3  $\text{m}^2/\text{V/s}$  respectively. Calculate the Resistivity.



- (d) Explain Hall effect in semiconductors.
- (e) Explain dc Josephson effect.
- (f) Explain Type I and type II superconductors.

(3 × 5 = 15 Marks)

St. Xavier's College

