



PAT-003-020204

Seat No. _____

M. Sc. (Physics) (Sem. II) Examination

August / September - 2020

Physics : CT-08

(Solid State Physics)

Faculty Code : 003

Subject Code : 020204

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (1) Attempt all questions.
(2) All questions carry equal marks.
(3) Mathematical symbols have equal meanings.

- 1** Answer in brief any seven : **14**
- (a) What is crystalline material? **2**
 - (b) What are symmetry elements? **2**
 - (c) What is aliovalence? **2**
 - (d) What are the line defects in solids? **2**
 - (e) What are Brillouin zones? **2**
 - (f) Define the superconductivity. **2**
 - (g) Define persistent current. **2**
 - (h) Draw the spin arrangements of paramagnetic, ferromagnetic and antiferromagnetic materials. **2**
 - (i) Comment on susceptibility for different magnetic materials. **2**
 - (j) Define polaron and magnon in solids. **2**
- 2** Answer any two of following questions : **14**
- (a) On the basis of Weiss-molecular field theory obtain a relationship between T_C and λ . Comment on temperature dependence of saturation magnetization. **7**
 - (b) Discuss the Heisenberg exchange integral and Slater's criteria. **7**
 - (c) Antiferromagnetic and ferrimagnetic materials. **7**

- 3 (a) Discuss the Langevin's classical theory of diamagnetism. 7
- (b) Discuss the Langevin's classical theory of paramagnetism. 7

OR

- (a) What are the limitations of Langevin's classical theory of paramagnetism? Write a note on quantum theory of paramagnetism. 7
- (b) Discuss in detail various contributions of magnetic moment of atoms in paramagnetic materials. 7
- 4 Answer any two of following questions : 14
- (a) Write a note on symmetry elements. 7
- (b) Write names of three X-ray diffraction experimental set ups. Discuss each in depth. 7
- (c) Discuss in detail the self interstitial in elemental solids. Write short notes on edge and screw dislocations. 7
- 5 Answer any two of following questions : 14
- (a) Discuss the types of superconductors. Write a note on London equations for superconductivity. 7
- (b) Describe Type-I and Type-II superconductors with suitable examples. Discuss various applications of superconductors. 7
- (c) Write a note on BCS theory of superconductivity and its outcomes. 7
- (d) Describe in detail the Kronig-Penney model. 7