

Enrollment No: _____

Exam Seat No: _____

C. U. SHAH UNIVERSITY

Winter Examination-2022

Subject Name : Elements of Solid State Physics

Subject Code : 5SC03ESP1

Branch: M.Sc. (Physics)

Semester: 3

Date: 21/11/2022

Time: 11:00 To 02:00

Marks: 70

Instructions:

- (1) Use of Programmable calculator and any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
-

SECTION – I

- Q-1** **Attempt the following questions.** **(07)**
- a. What is F-centre? **01**
 - b. Define: Unit cell. **01**
 - c. Draw (111) miller indices. **01**
 - d. What is called Point defect? **01**
 - e. What is called crystal structure? **01**
 - f. What is Homo Lumo? **01**
 - g. Plot phonon dispersion curve for diatomic molecule. **01**
- Q-2** **Attempt all questions** **(14)**
- A** Explain: Kroning Penny model. **07**
- B** Derive an expression of dispersion relation of lattice vibrations in monoatomic lattices. **07**
- OR**
- Q-2** **Attempt all questions** **(14)**
- A** Describe the Bloch theorem. **04**
- B** Find ratio of Fe^{2+}/Fe^{3+} in metal deficiency of $Fe_{0.96}O$. **03**
- C** State and explain the Schrodinger wave equation. **07**
- Q-3** **Attempt all questions** **(14)**
- A** Explain: Reciprocal lattice of bcc. **07**
- B** Explain: Effective mass and velocity of an electron. **07**
- OR**
- Q-3** **A** Explain Schottky and Frenkel defect in brief. **05**
- B** Differentiate Conductor, Semi-conductor and insulator. **05**
- C** If the energy required to create vacancy in a metal is 1 eV, calculate the ratio of vacancies in metal at 1000 K and 500 K. **04**



SECTION – II

- Q-4** **Attempt the following questions.** **(07)**
- a. What do you mean by piezoelectricity? **01**
 - b. What is the Bohr magneton? **01**
 - c. Write the formula of Electrical susceptibility. **01**
 - d. What are the examples of non-polar molecules? **01**
 - e. Give the examples of ferrimagnetism. **01**
 - f. Define: Domains. **01**
 - g. What is the formula of Larmor frequency? **01**
- Q-5** **Attempt all questions** **(14)**
- A** Explain the Larmor precession phenomena of magnetic material. **07**
 - B** What is called polarization? Give its type. Explain in detail electronic polarization. **07**
- OR**
- Q-5** **Attempt all questions**
- A** State and explain Clausius- Mossotti relation in terms of dielectric and polarizability. **05**
 - B** Explain: Hysteresis loop. **06**
 - C** If the static dielectric constant of NaCl crystal is 5.6 and its optical refractive index is 1.5, calculate the ratio of its electrical polarizability and its polarizability. **03**
- Q-6** **Attempt all questions** **(14)**
- A** Explain classical theory of paramagnetism. **07**
 - B** Explain in details Local electric field of an atom. **07**
- OR**
- Q-6** **Attempt all Questions**
- A** Explain Langevin's theory of diamagnetism. **07**
 - B** Explain the domain theory of ferromagnetism. **07**

