

Time: 2 Hours

Marks: 50

1. Attempt **ANY TWO** of the following.
 - i) Draw a molecular orbital diagram for triiodide ion and explain its structure and bonding. 5
 - ii) What is sp^3d hybridisation? Explain with suitable example. 5
 - iii) What are ion-dipole and dipole-dipole interactions? Give suitable examples. 5
 - iv) Derive the wave functions for the hybrid orbitals of beryllium dichloride molecule 5
2. Attempt **ANY TWO** from the following.
 - i) Draw molecular orbital diagram for methane molecule on the basis of SALC. 5
 - ii) State and explain great Orthogonality theorem with suitable example. 5
 - iii) Discuss the criteria for a set of elements to form a group by giving suitable example. 5
 - iv) What are Abelian and Non-Abelian point group? Explain with examples. 5
3. Attempt **ANY TWO** of the following
 - i) Give structural features of fluorite and antiferite solids. Mention coordination number of ions in it. 5
 - ii) Discuss in detail, biological method of preparation of nanomaterials. 5
 - iii) What are types of LASERS? Describe the principle of solid-state lasers. 5
 - iv) Write a note on, 'Application of Band theory in conductivity of solids' 5

4. Attempt **ANY TWO** of the following:
- i) Explain in brief, determination of stability constant by spectrophotometric method. 5
 - ii) Schematically represent the stepwise and overall formation constant for metal complexes. 5
 - iii) Write a note on 'Racah Parameters'. 5
 - iv) Draw the Orgel diagram for d^1 configuration in weak octahedral environment. 5
- Assign the electronic transitions.
5. Attempt **ANY FIVE** of the following 10
- i) Draw the resonating structures of carbonate ion.
 - ii) Explain the concept of hydrogen bonding with reference to water molecule.
 - iii) Draw group multiplication table for water molecule
 - iv) What are symmetry operations and symmetry elements? State the examples.
 - v) Define the terms: 1. First Brillouin zone 2. Fermi Energy.
 - vi) State any four applications of solid-state lasers.
 - vii) Give any four applications of ESR in Inorganic chemistry.
 - viii) List important methods for detection of complex formation.
