M.Sc. Second Year (Physics) CBCS Pattern Semester-III

PSCPHYT10 - Core Paper-X - Solid State Physics and Spectroscopy

P. Pages : 2 **GUG/W/23/11296**

Time : Three Hours * 6 3 1 5 * Max. Marks : 80

Either:

1. a) Write a detailed note on Order in Solids-Crystal classes and system. Also explain 2d and 3d lattices in details. **8**

b) Explain the concept of Point group, Space group and bonding of common crystal structure. **8**

OR

e) Explain the concept of Miller and Bravais indices in details. **8**

f) Write a note on: **8**
i) Quasi crystal and glasses.
ii) Liquid crystals and its types.

Either:

2. a) Discuss in details about Point defects, line defects and stacking faults. **8**

b) Write a note on: **8**
i) Presence of dislocation and dislocation motion.
ii) Burgers vector and Burger circuit.

OR

e) Discuss polarization mechanisms. **8**

f) State and Explain Clausius-Mossotti equation for dielectric properties. **8**

Either:

3. a) Explain the spectra of Helium atom and explain why the ground state of helium atom is very low lying. **8**

b) Explain: **4+4**
i) Spectrum of alkali atom
ii) Hyperfine structure

OR

e) State and explain Franck-Condon principle. **8**

f) Explain the term LS and JJ coupling for a two-electron system is 1 = 2 and 5 = 1 calculate **8**
i) Total orbital momentum quantum number L.
ii) Total spin momentum quantum number S.
iii) Total angular momentum quantum J in L-S coupling.
iv) Multiplicity

Either:

4. a) Discuss electronic spectra of diatomic molecules in brief. **8**

b) Explain Raman spectra of diatomic molecules. **8**

OR

e) Discuss P, Q and R branches in rotational structure transitions. **8**

f) Discuss ESR and NMR spectroscopy. **8**

5. Attempt all of the following:

a) Explain reciprocal lattice. **4**

b) Discuss dislocation reactions. **4**

c) Write a short note on Inner shell vacancy. **4**

d) What do you mean by Morse potential energy curve? **4**

****