K25U 0170

Reg. No. : .....

Name : .....

Sixth Semester B.Sc. Degree (C.B.C.S.S.-OBE – Regular/Supplementary/ Improvement) Examination, April 2025
(2019 to 2022 Admissions)
CORE COURSE IN PHYSICS
6B10PHY : Solid State Physics and Spectroscopy

Time : 3 Hours Max. Marks : 40

SECTION – A **(6)**

Six short answer questions. Answer **all** questions. **Each** question carries **one** mark **each**.

1. When a semiconductor is doped with suitable impurity, its conductivity _____
2. The volume of a primitive unit cell of a FCC structure with lattice constant 'a' is _____
3. A hot band will increase in intensity as temperature of the sample _____
4. Give an example for symmetric top molecule.
5. Raman spectrum appears due to the scattering of radiation by the _____ molecules.
6. The expression for rotational constant B is _____

SECTION – B **(12)**

Eight short answer type questions. Answer **any six** questions. **Each** carries **two** marks.

7. What do you mean by the co-ordination number of a lattice ? What is the co-ordination number of FCC lattice ?
8. Write down Bragg's law and explain their symbols.
9. Write a short note on applications of Hall effect.

10. Distinguish between extrinsic and intrinsic semiconductors.

11. What is meant by a diatomic vibrating rotator ?

12. What are Stoke's and anti-Stoke's lines ?

13. Write a short note on Fermi energy.

14. Explain the term zero-point energy of an IR active molecule.

SECTION – C **(12)**

Six problems questions. Answer **any four. Each** question carries **three** marks.

15. Electrons are accelerated by 844 volt and are diffracted from a crystal. The diffraction maximum occurs when glancing angle is 58°. Determine the spacing of the crystal.

16. The resistivity of A1 at room temperature is 2.62×10^{-8} Ωm and concentration of A1 atoms is $18.07 \times 10^{28}/m^3$. Calculate i) mobility ii) the drift velocity of conduction electrons in a field of 50 V/m and iii) relaxation time.

17. Draw the following planes in an FCC structure : (112) and (120) planes.

18. Explain the anharmonic vibration spectrum of diatomic molecule.

19. Cu has FCC structure and has an atomic radius of 1.278 angstrom. Calculate the density, if the atomic weight of Cu is 68.54 amu.

20. Calculate the intrinsic concentration of charge carriers of Germanium at 300K. $E_g = 0.67$ eV. Given $m_e^* = 0.12\ m_o$ and $m_p^* = 0.28\ m_o$.

SECTION – D **(10)**

Four long essay questions. Answer **any two**. **Each** question carries **five** marks.

21. Obtain Bragg's law of X-ray diffraction. Discuss the basic principle of powder method.

22. What are Miller indices ? What are their significances ? How are they determined ?

23. Explain rotational spectra of diatomic molecules.

24. Explain mobility of charge carriers in semiconductors.

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