

**VIT**Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

REG.NO.:

**SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026**

SLOT:G1+TG1

Programme Name & Branch : B.Tech Electronics and communication Engineering
Course Code and Course Name :BAPHY107, Physics of Semiconductor devices
Faculty Name(s) : Anusha P T
Class Number(s) :
Date of Examination :28.08.2025
Exam Duration : 90 minutes **Maximum Marks: 50**

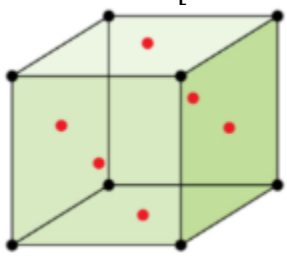
General instruction(s):

- Answer All Questions
 - M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes
CO1-Classify

Q. No	Question	M	CO	BL
1.	Describe point defects in crystalline solids. Explain Schottky defect, Frenkel defect and discuss their effect with suitable diagrams Key: Definition[2 marks] Classifications [2 marks] Schottky defect with example [2 marks], Diagram[1 Mark] Frenkel defect[2 marks], Diagram[1 Mark]	10	CO1	BL2
2.	(a)What are the physical significance of reciprocal lattice vectors? Key: • Each reciprocal lattice vector ($\mathbf{G}$) corresponds to a set of equally spaced lattice planes in real space. • Direction of $\mathbf{G} \rightarrow$ normal to the planes, Magnitude of $\mathbf{G} \rightarrow$ inversely proportional to the interplanar spacing d • smaller plane spacing corresponds to larger reciprocal lattice vectors. • They describe how electron waves, phonons, and photons interact with the periodic potential of the lattice. • Reciprocal lattice vectors provide a natural framework for describing periodicity, diffraction, and electronic behavior in crystals, making them fundamental tools in solid-state physics and crystallography. [5 Marks] (b) A crystal has a cubic lattice with lattice parameter a . A plane in the crystal cuts the axes at $x=a/2$, $y=-a$ and is parallel to z axis. Determine the miller indices. Key:	10	CO1	BL3
3.	(a) Discuss the role of Bravais lattices. Explain the crystal structure of a face-centred cubic (FCC) lattice with example Key: (a)Bravais lattice provide a systematic classification of crystal structures based on translational symmetry. In three dimensions, only 14 Bravais lattices are possible, grouped under 7 crystal systems . Bravais	5	CO1	BL2



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	lattices are essential in explaining anisotropic physical properties such as electrical conductivity, elastic behavior, and optical properties. FCC structure [2 Marks]  No. of atoms in unit cell :4 High density compared to SC and BCC Eg Cu, Ag, NaCl [3 Marks]			
	(b) 'Parallel planes in a crystal have the same Miller indices' Why? Key: Procedure to find Miller indices [3 Marks] Physical significance of Miller indices [2 Marks]	5		
4.	(a) Using Bragg's diffraction, explain how interplanar spacing of crystal planes can be determined ? Key: Derivation[3 marks] Diagram [2 marks]	5	CO1	BL3
	b) A metal with body centered (BCC) structure show the first diffraction peak at a Bragg angle of $\theta = 30^\circ$ for the plane [110]. The wave length of X ray used is 2.1 Angstrom. Find the volume of primitive cell of the metal? Given Bragg's law $2d\sin\theta = n\lambda$. Key: D=2.1 Angstrom (2 marks) A=2.9 Angstrom (1 mark) Vol of unitcell= 24.3 cubic Angstrom (1 mark) Vol of Primitive cell= 12.19 Cubic Angstrom (1 mark) If units are not present 1 mark will be reduced.	5		
5.	Discuss secondary bonding in solids. Explain hydrogen bonding and van der Waals forces, their origin, characteristics, and importance in molecular solids. Key: Hydrogen bonding Conditions[2 marks] Effects on solubility, boiling point, surface tension, viscosity[3 marks] Van der Waals forces Types[3 marks] Consequences[2 marks]	10	CO1	BL2



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