BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: IMSC **SEMESTER : V/ADD**
BRANCH: PHYSICS **SESSION : MO/2025**

SUBJECT: PH306/PH306R1 MATERIALS SCIENCE AND NANOTECHNOLOGY

TIME: 02 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Define unit cell and space lattice.	[2]	1	1
Q.1(b)	Find the atomic packing fraction of the FCC and BCC structures.	[3]	1	1
Q.2(a)	Define crystallographic directions. Discuss the procedure to determine the direction in the crystal system.	[2]	1	1
Q.2(b)	Classify point defects. Explain Schottky and Frenkel defects.	[3]	1	2
Q.3(a)	Calculate the number of atoms/mm^2 present in (1 1 1) planes for lead, which has an fcc structure. The radius of the atom is 0.174 nm.	[2]	1	3
Q.3(b)	Define elastic limit. Compute strain energy per unit volume for volume strain.	[3]	2	1
Q.4(a)	Define dislocation density.	[2]	2	1
Q.4(b)	Explain the role of dislocation in plastic deformation.	[3]	2	2
Q.5(a)	Define slip system.	[2]	2	1
Q.5(b)	Explain strain hardening mechanisms.	[3]	2	2

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