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

CLASS: IMSc **SEMESTER : V**
BRANCH: PHYSICS **SESSION : MO/2025**

SUBJECT: PH306R1 MATERIALS SCIENCE AND NANOTECHNOLOGY

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Define a unit cell. Calculate the atomic packing fraction of the hexagonal close-packed structure.	[5]	1	1
Q.1(b)	Classify the defects based on their geometry. Explain edge dislocation in detail.	[5]	1	2
Q.2(a)	Describe Hooke's law. Draw a stress-strain plot of a wire and explain it.	[5]	2	1
Q.2(b)	Define plastic deformation. Explain strain hardening mechanisms.	[5]	2	1
Q.3(a)	Classify ceramic materials on the basis of their application. Explain refractory ceramics.	[5]	3	2
Q.3(b)	Discuss AX, A_mX_p and $A_mB_nX_p$ types of ceramics structure.	[5]	3	2
Q.4(a)	Explain the crosslink and network polymers. Differentiate between thermoplastic and thermosetting polymers.	[5]	4	2
Q.4(b)	Define fibre-reinforced composites. Explain the effect of fibre length on the mechanical properties of the composites.	[5]	4	1
Q.5(a)	Explain the lithographic technique for making nanostructures.	[5]	5	2
Q.5(b)	Discuss the sputtering method for depositing thin films.	[5]	5	2

::::::24/11/2025::::::E