Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
(GIET University)

B. Tech(Fifth Semester – Regular) Examinations, November 2025

23BCHOE35001-Material Science

(Chemical Engineering)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions		CO #	Blooms Level
a.	Define Lattice. Define space lattice (or) crystal lattice.	CO1	K1
b.	Explain the term Critical Resolved Shear Stress (CRSS).	CO2	K2
c.	What are the types of heat Treatment?	CO4	K1
d.	What is the critical angle ϕc for light passing through diamond? Take n_1=2.41 into air & n_2=1	CO5	K1
e.	Differentiate alloy & composite.	CO6	K3

PART – B **(10 x 5=50 Marks)**

Answer ***ALL*** the questions		Marks	CO #	Blooms Level
2. a.	What is meant by crystal defects? Describe in detail the point, line and surface defects.	5	CO1	K2
b.	What is CRSS? Derive an expression for CRSS.	5	CO2	K3
	(OR)			
c.	Explain the following (1) Edge distortion (2) Screw Distortion	5	CO1	K2
d.	Explain recovery, recrystallization and grain growth with proper diagram.	5	CO2	K2
3.a.	Aluminium has FCC structure and its density is 2700kg/m3. Calculate the unit cell dimension and atomic diameter. (Aw of Al =26.98 g/mol).	5	CO1	K3
b.	Explain the working of a Helium-Neon laser.	5	CO5	K3
	(OR)			
c.	Classify bonding in solids and explain briefly.	5	CO1	K2
d.	Compare and contrast optical, mechanical, and thermal properties of ceramics and plastics.	5	CO5	
4.a.	What is solid solution? Explain the typeof solid solutions with sketch.	5	CO3	K2
b.	Write short notes on the following: i) Scattering of light in materials ii) Refractive index and its significance	5	CO5	K2
	(OR)			
c.	Draw the Bi-Cd alloy phase diagram & explain with proper labelling.	5	CO3	K2
d.	What are ceramic materials? Explain briefly different types of ceramics.	5	CO5	K2
5.a.	Draw the phase diagram of a system in which the two components are completely soluble in the liquid state and partly soluble in the solid-state having terminal solid solutions α & β. Label the phase diagram with proper labelling. Show the liquidus curve, solidus curve and solvus curves in the system. Show the eutectic temperature & the composition of eutectic alloy.	5	CO3	K3

b.	Compare annealing and normalizing processes. How do they affect grain size, internal stress, and mechanical properties?	5	CO4	K4
	(OR)			
c.	Apply the lever rule to determine the amount of liquid and solid phases at a given temperature for an isomorphous system (use a neat diagram).	5	CO3	K3
d.	Draw the T – T – T diagram for eutectoid steel &explain the phase transformations in brief.	5	CO4	K3
6.a.	Explain the yield point phenomena observed in mild steel. How does it relate to dislocation theory?	5	CO4	K4
b.	Cite several reasons why fibre glass reinforced composites are utilized extensively.	5	CO6	K2
	(OR)			
c.	Discuss the effects of alloying elements (Cr, Ni, Mo, V, W, Mn, Si) on the mechanical properties and microstructure of steels.	5	CO4	K4
d.	Explain the mechanical behavior of composite materials. How does the fiber–matrix bonding affect strength, stiffness, and toughness?	5	CO6	K4

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