BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION SP/2025)

CLASS: BTECH **SEMESTER : IV**
BRANCH: CHEMICAL ENGINEERING **SESSION : SP/2025**

SUBJECT: CL227 MATERIALS SCIENCE AND ENGINEERING

TIME: 03 Hours **FULL MARKS: 50**

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)	Describe zone refining process. Lebel tetrahedron structure of different parameters of Material Science and Engineering. Write the steps to determine Miller Indices in arbitrary direction.	[5]	3	1
Q.1(b)	Differentiate Hypo eutectoid steel vs Hyper Eutectoid Steel. Convert cubic to hexagonal direction. Classify the defects based on dimensionality.	[5]	3	2
Q.2(a)	Illustrate Frenkel defects and Schottky defects. Illustrate the purpose of heat treatment. Discuss the characteristics of grain boundary.	[5]	3	3
Q.2(b)	Summarize the four bulk deforming processes. Discuss the three defects in extrusion of metal. Point out the salient features of induction hardening.	[5]	3	2
Q.3(a)	Classify some properties of inorganic glasses. Differentiate the properties of glass ceramics. Choose the selection criteria for refractory materials.	[5]	1	4
Q.3(b)	Judge the advantages and disadvantages of bioceramics. Compile the important points of the improvement of resorbable ceramics. Justify the advantages of optical fiber communication.	[5]	2	5
Q.4(a)	Classify leaching process. Describe the salient features of these processes and give example of metals that are extracted by these processes.	[2+4]	3	2
Q.4(b)	Compare the following processes in terms of reaction involved, reagents used, and products formed: roasting and smelting.	[4]	3	4
Q.5(a)	Describe the effect of processing conditions on the crystallinity of semicrystalline polymers in terms of mechanical properties. “Natural rubber undergo crystallization though it is amorphous at room temperature”-explain the reason.	[3+2]	4	3
Q.5(b)	Draw the graph of modulus vs. Temperature for a polymer. Mention the various thermal transitions in this graph and explain the reason of such transitions in terms of the molecular movement associated with the polymer.	[2+3]	4	3

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