

B.E. CHEMICAL ENGINEERING
SECOND YEAR SECOND SEMESTER EXAM – 2025
Subject: MATERIAL SCIENCE & ENGINEERING

Time: 3hr.

Full Marks:100

INSTRUCTIONS: ANSWER ALL CO'S.

CO1

1. **Short note (any five):** i. Beneficiation of ore, ii. Concentration, iii. Dewatering, iv. Pyrometallurgy, v. Flotation, vi. Smelting, vii. Leaching, viii. Roasting. 5x5=25

CO2: Answer any one

2. (a) What does coordination number mean? What is the coordination number in copper crystal? What is an Ellingham diagram for formation of metal oxide? What do you understand from this diagram?
(b) Draw the flow sheet and explain the extraction process of zinc from its any minerals, write the advantages of zinc in chemical industries? 3+3+5+4+7+3=25
3. (a) Draw the Fe-Fe₃ phase diagram and identify different phase regions and the important composition and temperature. What is Ledeburite ?
(b) Draw the flow sheet and explain the extraction process of pig iron. Discuss the role of cryolite in the aluminum extraction process. 7+3+10+5=25

CO3: Question number 6 is compulsory and answer any one from Q4&Q5

4. What is “predominance area diagram?” with one example plot a predominance area diagram? How has it benefited the chemical-related extraction plant? What are the advantages of composite materials in chemical industries? 4+6+5+5=20
5. What are nanostructured materials? What is Graphene? What is natural polymer? What is 316L alloy? Write the advantages of titanium and nickel in chemical industries? 3+4+4+4+5=20
6. Short note (any one) : i. Ni- alloys ii. Biopolymer. 5

CO4: Answer any one

7. What is crevice corrosion? What is bio composite? Give an examples and discuss. What do you think about corrosion protection of metals? Draw the role of application of anti-corrosive agents in chemical industries. 4+5+5+5+6=25
8. What is TEM? How does it works with suitable sketch? Define Bragg's law, explain at least one type of material characterization technique where this law has been used. 5+8+6+6=25