

CO1 Compulsory- Answer any **one**

1. What do you mean by beneficiation of ore? Mention the various parameters influencing the choice of mineral processing methods. What are the principle steps of mineral processing? What are the effective methods of size reduction?  $5+7+8+5=25$
2. Explain the terms calcination and roasting. Describe briefly about the various types of leaching processes. Give a classification of the reagents used in flotation like collectors, frothers and regulators.  $12+8+5=25$

CO2 Compulsory- Answer any **one**

3. Define Phase. Write down Gibbs Phase rule. Define “degree of freedom”. Find the packing density for a copper crystal? Whether this result differ from Iron crystal? Give reason in support of your answer. What is the advantages of martensite?  $3+4+3+5+4+3+3=25$
4. Draw the Fe-Cementite phase diagram and identify different phase regions and the important composition and temperature. Why Fe-Cementite phase diagram is not called a true equilibrium diagram? How does eutectoid reaction differ from eutectic reaction? What are the phase constituents at room temperature of a 0.6 wt pct carbon steel?  $9+5+6+5=25$

CO3: **Compulsory**

5. Short note (**any five**) : i. Light metals, ii. Supper alloys iii. Composite, iv. Polymer, v. Ceramics, vi. Nanostructure materials. vii. Zinc oxide.  $5 \times 5 = 25$

CO4: Compulsory- Answer any **one**

6. a) Draw the flow sheet and explain the extraction process of nickel from sulphide ores. What is the advantages of nickel in chemical industries?  
b) Draw the flow sheet and explain the extraction process of zinc from its any minerals, write the advantages of zinc in chemical industries?  $8+5+8+4=25$
7. a) Define corrosion. Based on the appearance of corrosion damage, categorize the different forms of corrosion. Explain the galvanic and cathodic protection of metals.  
b) What is SEM? 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.  $5+8+6+6=25$