Ref. No.: Ex/Che/ES/B/Met/T/222/2022

B.E. Chemical Engineering 2nd Year 2nd Semester Exam 2022

Subject: MATERIAL SCIENCE & ENGINEERING

Time: 3 hours **Full Marks = 100**

*(Answer **Question No: 1** and 7 and any **four** from the rest)*

1. Answer any eight questions: **8 × 3 = 24**

A. Metal oxides are unstable at high temperatures. Explain using the Ellingham diagram?

B. What is heap leaching?

C. Write down the bacteria used for leaching Cu and Fe ores?

D. Name the process used for desilverization of lead. What is lead bullion?

E. What is electro slag refining?

F. What is the function of limestone and coke in the smelting of haematite?

G. What is the function of electrolytes?

H. State the difference between electrowinning and electroplating.

I. Difference between dry corrosion and wet corrosion.

2. **2 + 4 + 5 + 3 = 14**

What is sintering? What are the objectives of sintering? Discuss the mechanism of sintering. Explain the role of flux in sintering.

3. **(2 + 6) + 6 = 14**

A. What is smelting? Describe the different types of smelting with example.

B. Discuss the process of Cu extraction briefly using the reverberatory furnace.

4. **4 + 6 + 4 = 14**

Draw a neat labeled diagram of the blast furnace used in extracting cast iron. Give the chemical reactions that take place in the different zones of the furnace. With the help of Ellingham diagrams, explain why carbon monoxide acts as a reducing agent in cast iron production from haematite.

5. **(2 + 6) + 6 = 14**

A. What are the typical ore minerals used for Zn extraction? Following the hydrometallurgical process route, how the Zn can be extracted – explain by drawing a simple process flow chart.

B. Draw a schematic and show the Zn recovery system following the pyrometallurgical process route?

[Turn over

6. **2 + 4 + 8 = 14**

What is the difference between rusting and corrosion? Based on the appearance of corrosion damage, categorize the different forms of corrosion. How does pH affect the corrosion rate of iron?

7. **Short note: (Any four)** **4 × 5 = 20**

A. Advantages of Hydrometallurgy over pyrometallurgy

B. Importance of flotation in mineral concentration.

C. Cementation.

D. Predominance Area Diagram.

E. Liquation

F. Pitting corrosion