

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY, BURLA
DEPARTMENT OF METALLURGICAL AND MATERIALS ENGINEERING
SESSION 2015-16 (ODD SEMESTER)

Total Pages – 2

B.Tech-5
PEM

PRINCIPLES OF EXTRACTIVE METALLURGY

Full Marks: 70

Time: 3 hours

Q.No.1 is compulsory, and answers any five from the rest of the questions

The figure in the right –hand margin indicates marks.

1. Answer the following (Any ten)

[2 x 10]

- (a) Draw the schematic diagram of basic electrical circuit used for electrolysis process.
- (b) What do you mean by electrode potential? Write down any two important applications of it.
- (c) State Faradays 2nd laws of electrolysis, and also define electrochemical equivalent.
- (d) Why halide metallurgy is preferred for production of refractory metals like Ti, Ta, and Zr?
- (e) What do you mean by unit process, and unit operation? Explain with suitable examples.
- (f) What is extraction coefficient, and segregation coefficient?
- (g) What is basicity of slag? And what is the main function of flux in smelting operation.
- (h) Explain the fluidization curve for FBR with a suitable graph.
- (i) Why it is difficult to get 100 percent pure metals?
- (j) Differentiate between matte and reduction smelting.
- (k) What do you mean by metal loss in slag, and how it is sometimes advantageous and disadvantage too?
- (l) Write the characteristic of matte and slag?
- (m) What is pressure leaching of an ore, and how it is advantageous?

2. Write short notes on any *three* of the following :

[10]

- (a) Sinter roasting
- (b) Halide metallurgy
- (c) Vacuum pyro-metallurgy
- (d) Vapour transport method of refining or refining through intermediate gaseous phase

3. (a) What are the differences between extraction of aluminium and iron, and why aluminium cannot be extracted through pyrometallurgy route? Suggest some good points.

(b) What do mean by liquation refining and fire refining of metals? Explain in brief with suitable example. [6+4]

4. What is flash smelting? And explain its advantages with a suitable diagram of a flash smelter.

Or

Draw the diagrams of the various metallurgical furnace used in Pyrometallurgical route of extraction, and what kind of atmospheric condition prevailing inside it. [10]

5. (a) What are the different chemical methods for purification of leach liquor, explain any one of them in details.

(b) In a copper ore chalcopyrite is 34 %, pyrite 30 %, and SiO_2 36 %. Determine the percentage of iron copper and sulphur. [6+4]

6. (a) What is liquid extraction? Explain each steps of extraction taking example of uranium recovery.

(b) How one can choose a good organic phase (extractant) for solvent extraction process, explain it in brief. [6+4]

7. (a) Draw a diagram to explain the series, and multiple arrangements of electrodes in an electrolytic cell, and also, explain why for reactive metals like Li, Na we use molten salt electrolyte not aqueous salt.

(b) Explain the kinetics of ion exchange process in details. [6+4]

8. (a) What are ion exchange resins? Explain their characteristics, functions, and types.

(b) Write short notes on the following

I. Ellingham diagram

II. Predominance area diagram

[6+4]

Or

(a) Briefly describe the following

i. Oxidising power of slag

ii. Silicate degree of slag

iii. Sulphide capacity of slag

(b) Explain electrochemical mechanism of leaching. Solve this numerical: What will be the activity of NaCl present in a solution of (50%NaCl and 50%KCl), and (50 % NaCl, and 50 % KBr).

[6+4]
