

Ref No. Ex/Met / T / 323/2017

B Met Engg 3rd year 2nd Semester Examination 2017

SUBJECT : Extraction of Non-ferrous Metals

Time Three hours

Full Marks 100

Answer question No 1 and any four from the rest, all questions are of equal marks

1. Explain the followings with example

4X5

a. Fluidized bed Roasting b Matte smelting c. Dressing d. Oxidizing leaching e. Cell Potential for electrowinning

2. Discuss the following process

a. Carbonyl process for refining Nickel

b Pigeon Process for extraction of Mg

c. Production of Blister Cu from Cu concentrate with Flash smelting

d. Parke's Process for Pb

5+4+6+5

3. Draw a flowchart to produce pure Al_2O_3 from the bauxite ore. Explain the following on Bayer process.

(i). How will you decide temperature, pressure and concentration of leaching solution for the ore with different percentage of Boehmite and Gibbsite in the ore. (ii) Why bauxite ore with high % of Silica is not considered as economically viable (iii) Why a critical cooling temperature is required during precipitation stage. (iv) the various factors which control the kinetics of precipitation and agglomeration and how to get very fine precipitate.

5+4+2+4+5

4.a Explain how cyanide leaching of Au is an electrochemical process with anodic and cathodic areas and reactions. Derive the equation of the rate of this leaching involving leachant concentration. Is cyanide leaching activation or concentration polarization controlled? explain and show how to enhance the rate.

4+3+4

4b Explain how do you do acid leaching pitch blende ore and control the parameters to increase leaching rate Give comparative silent feature of acid leaching with alkali leaching

5+4

5. a. Explain with an example how a metal ions can be enriched by cation exchange resin in ion exchange process. What is selectivity? On what factors does it depend ? Illustrate with sketch separation of two metals M and N, M having higher selectivity for the resin.

3+1+2+3

[Turn over

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5 b. What are the different types of organic solvent used in solvent extraction? What is extraction coefficient? Show that multistage counter current contacting is the most efficient in SE . What is Mc. Cabe Diagram ?

4+1+4+2

6. a Discuss the criteria of thermodynamics and kinetics factors that control the metal production from leached solution by H₂ gas. State also some salient points to increase the rate of production.

8+2

6.a. Explain the thermodynamics and kinetics conditions for cementation of a metal M, from its aqueous solution by another metal M₂. How these conditions are achieved ? How will control the process parameters to produce fine cemented metal powder.

4+3+ 3

7.a. Draw a labeled diagram and explain the electrolytic production of Al from cryolite bath . What is the role of Cryolite here. How the various factors affect this process. What are the advantages of ALCOA "process over this process.

4+4+2

7.b. Elucidate a comparative discussion of Electrorefining and Electrowining of Cu in the light of (i) Electrode reactions

(ii) Cell potential and overvoltage required (iii) current efficiency (iv) Size and purity of cathode 10

8. Write short notes on the followings

6+ 5+4 +5

- Leaching methods and equipments
- Mg production from sea water through Hydro and Electro metallurgical Route.
- Leaching of Pentlandite ore to produce enriched solution of Ni and Co
- Different types of Roasting and Smelting