Ex/Met / T / 323/2018

B Met Engg 3rd year 2nd Semester Examination 2018

SUBJECT : Extraction of Non-ferrous Metals

Time Three hours Full Marks 100

Answer any five questions , all questions are of equal marks

1. Explain the basic principles of pyrometallurgical extraction of metal sulphide ore . How the predominace area diagram helps to determine the operating conditions of roasting. what are its constituents of matte ? Why matte smelting is so important ? How the roasted product is reduced to metal.

5+4+2+4+5

2.Discuss the following process

a. extraction of Mg by Pyro, hydro and electro metallurgical process

b. Production of Blister Cu from Cu concentrate with Flash smelting c. Parke's Process for Pb

10+6+4

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. Describe with example how E-pH diagrams of the wanted metal and gangue help in selecting proper leachant. State the other factors in choosing a leachant. 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. 3+ 4+ 3+ 3 +4+3

5.Distinguish between following 5X4

i. Electro refining of Cu and Electrowining of Cu
ii. Solvent Extraction and on Exchange
iii. Aqueous solution Electrolysis and Fused Salt Electrolysis
iv Pressure Leaching and Bio leaching

[Turn over

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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

b.. 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

8.Write short notes on the followings 6+ 6+4 +5

a. Leaching methods and equipments
b. Merit and Demerit of Pyro and Hydrometallurgical extraction of metal for high productivity, less cost and the minimum environmental pollution.
c. Electrolytic Production of Al , factors controlling it
d. Cell Potential from aqueous solution and fused salt electrolysis