M. TECH. MATERIAL ENGG. EXAMINATION, 2004

(1st Semester)

PHYSICO CHEMICAL PROCESSING OF MATERIALS

Time : Three hours   Full Marks : 100

(50 marks for each part)

Use a sepapate answer-script for each part

PART I

Answer question 1 and any *two* from the rest.

1. a) Compare efficiciency of separation between dry and wet magnetic separation.

   b) How can you decrease the entrapment of non-magnetic particle in magnetic fraction ?

   c) What is ideal contact angle for flotation ? Explain.

   d) Is crushing efficiency increased by increasing the speed of rotation of grinding mill ?

   e) What is liberation of minerals ? How it plays during separation technique ?   2×5

2. a) Explain the principle of oxidising roasting with an example.   10

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b) Explain the role of chlorination roasting of ilmenite. How can you decrease the contamination level of iron ?   10

3. a) What is segregation roasting ? Explain the various reactions involved in popper segregation from sulphide concentrate.   10

b) Give one industrial application of reduction roasting with process details.   10

4. a) What is matte smelting ? How can you produce copper matte from Ore? Discuss.   10

b) Explain the role of vacuum in Mg extraction using metallothermic smelting ?   10

PART II

Answer question number 5 and any *two* frem the rest.

5. Derive expression for the following properties.   5+5

a) $\left(\frac{\partial T}{\partial H}\right)_{s}$ in terms of Cp, α,β, V, T

b) $\left(\frac{\partial H}{\partial T}\right)_{V}$ in terms of Cp, α,β, V, T.

6. a) Deduce Gibbs-Helmholtz Equation.   8

b) What is Jule-Thomson effect ? What is inversion tempe-rature? Deduce relationship between Jule-Thomson co-efficient and temperature for a vandar walls gas.   2+2+8

7 a) Discuss in details the thermodynamics of oxidation of metals and dissociation of of metal oxides.   10

   b) Deduce the equation for the thermodynamic potential for oxidation reaction of moltenmetal at temperature T.   10

8. a) Establish the relationship between vapour pressure and the quantity of vapour of a substance.   8

   b) Describe the vacuum distillation technique for the seperation of zinc from brass scrap with the help of suiable diagrams   12

9. a) What is rectification refining ? Under what conditions the rectification refining is done?   2+6

   b) Describe the rectification refining technique of any one of the following   12

      i) Seperation of Zinc from cadmium.

      ii) Seperation of Zinc from Lead.