B.E. (MET) Part III 6th Semester Examination, 2013

Subject: NON-FERROUS METALLURGY [MT 603]

Full marks: 70 Time: 3 Hours

Use separate answer script for each half

First Half

Answer all questions

1. Ask any question related to any topic of relevance to this course and answer it briefly (say 250-300 words). The grading will depend on both the quality of the question and that of your answer. [10]

2. Differentiate in a few lines, the following from one another (any five)

a. Fissile and fertile atoms

b. Electro winning and electro refining

c. Direct and indirect chlorination

d. Monopolar and bipolar electrodes.

e. Ordinary leaching and bioleaching.

f. Primary metals and secondary metals. [2×5 = 10]

3. Discuss the reasons underlying ANY FIVE of the following statements.

a. During the Hall-Heroult Process Al_2O_3 concentration in cryolite bath must be controlled within a narrow range.

b. Carbon anodes used in Aluminium electrolysis imply both an advantage as well as a disadvantage

c. Reactive metal oxides cannot be produced through reduction by carbon.

d. Many Ferro alloying elements are produced not in elemental form but as ferroalloys.

e. Several reactive metal oxides are chlorinated in presence of carbon for enhanced chloride recovery.

f. Molten lead is employed for recovery of zinc in the Imperial Smelting.

g. Refining of an impure metal, M (i) to produce a pure metal, M (p), using an intermediate gas may be represented as follows.

$$\text{M (i)} + \text{Gas 1} \xrightarrow{T_1} \text{Gas 2} \qquad \text{(a)}$$

$$\text{Gas 2} \xrightarrow{T_2} \text{M (p)} + \text{Gas 1} \qquad \text{(b)}$$

T_1 can be greater or less than T_2 depending on enthalpy entropy changes of reaction (a)

[3×5 = 15]

Second half

Attempt any three. Two marks are reserved for neatness.

1. Justify the following: 3+3+3+2=11
   a. Noble metals can be successfully used in dentistry.
   b. For some aluminium alloys strengthening is possible both by strain hardening and precipitation hardening.
   c. Copper is the metal of civilization
   d. Tin bronze is also referred as phosphor bronze

2. Write short note on the following: 4+3+4=11
   a. Use of tungsten as heavy metals
   b. Monel Metal
   c. Classification of Aluminium Alloys

3. a. Define refractory metals. State some common uses of refractory metals with properties. 3+3+2+3=11
   b. Discuss how Tungsten is processed and fabricated?
   c. In what ways does molybdenum compare to tungsten?
   d. Comment on the corrosion resistance of Niobium (Nb).

4. a. Discuss properties and applications of Ni based super alloys. 3+4+4=11
   b. Classify alloy additions in Titanium based on their ability to influence the stability of different phases.
   c. Discuss different heat treatments of Magnesium alloys.