COLLEGE OF ENGINEERING, PUNE

ESE SEMESTER EXAMINATION

(MT-305) Iron Making

Year: T.Y.B-Tech
Academic Year: 2013-14
Duration: 3 Hours

Branch: Metallurgy
Date: Nov 2013
Max Marks: 60

Instruction to candidates:

1. **All questions are compulsory.**
2. **Assume suitable data if necessary.**

Q.1 A) Draw the curve for equilibrium reactions $FeO + CO = Fe + CO_2$ and $Fe_3O_4 + CO = 3\ FeO + CO_2$ in a diagram of 'Equilibrium CO/CO2 ratio' in contact with carbon and oxides of Iron at various temperatures". Explain the significance of each of the curves. [5]

What is the meaning of the point of intersection of these two curves? [2]

B) Describe, in detail, any three operational irregularities and the corresponding remedial measures, in blast furnace operation. [6]

C) State the limitations of Mini Blast furnaces. [3]

Q.2 A) Discuss Direct Reduction and Indirect Reduction in Blast furnace. [4]

B) State the raw materials required for a) Ferro-silicon and b) Ferro-chromium by electric smelting. [4]

C) How is basicity and viscosity optimized in Blast Furnace? [3]

D) Give the composition (weight percent) of hot metal produced in a common blast furnace. [3]

E) Define Critical Hearth Temperature with its significance. [2]

Q.3 A) State **True** OR **False** and Justify your answer. (No marks without proper justification.) [10]

1. Water cooling of Blast furnace refractory lining is essential.
2. For proper Blast Furnace operation, the liquid slag should have as high a viscosity as Possible.
3. The slag at the tuyere level is high in SiO_2 (acid slag).
4. Iron oxide reduction by H_2 is 5-10 times slower than that by CO.(justification not expected)

B) Write short notes on ----(**ANY TWO**) [8]

1. Corex Process
2. Midrex process
3. Advantages and disadvantages (Any Four each) of Low Shaft Furnace

Q.4 A) Explain in detail the reactions in Bosh. [5]

B) An ore has Fe_2O_3 86 %, SiO_2 6%, MnO 1.2, Al_2O_3 6.5 %, P 0.20 %. The pig iron produced contains C 3.5, Si 2.2, Mn 0.6, Fe 93, balance other impurities. 950 kg coke (containing 80 % C, SiO_2 12%, Al_2O_3 8 %) per ton pig iron is used. Limestone required is 450 kg/ton pig iron and limestone contains 5 % SiO_2 the rest $CaCO_3$. There is no loss of Fe to the slag. [5]

Find—

a) The amount of the ore in kg/ton pig iron.
b) Phosphorus in pig iron
c) The amount of slag per ton pig iron and its composition(CaO,SiO2,MnO,Al2O3)
d) The basicity of the slag.

(Atomic weight : Fe = 56, O = 16, Mn = 55 , Si = 28 , C = 12, P = 31, Al = 27 , Ca = 40)

****