

(4)

- b) Give 'S' refining reaction during steel making. Show the effect of FeO on Ds index. How can you produce extra low 'S' steel ? 5
- c) Is MnO behaviour will remain same for basic and acid slag? Explain with reference to $(MnO)_{sn} / [Mn]_{metal}$.
8. a) What are the external desiliconization treatment of hot metal ? Explain its role in steel making. 10
- b) Calculate the O_2 potentials of liquid steel at equilibrium with molten slag at 1600°C. Given : 10
- (i) Slag contains CaO, SiO_2 , FeO with 0.45, 0.40, 0.15 mole fraction respectively.
- (ii) $[O]_{wt\%} + [Fe]_l = (FeO)_l K_1 = 4.78$
1600°C
- (iii) $\{O_2\}_g = 2[O]_{wt\%}, K^2 = 6.89 \times 10^6$
1600°C

OR

- a) Explain the benefits of swinging lance compare to static lance in LD. Explain the 'P' reaction mechanism in LD. 10
- b) Compare 'C' reaction in hearth process with pneumatic process. Explain the 'C' refining reaction in Mixed process like LD. 10

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Ex/MET/T/321/91/2010

BACHELOR OF METALLURGICAL ENGG. EXAMINATION, 2010

(3rd Year, 2nd Semester)

STEEL MAKING

Time : Three hours

Full Marks : 100

(50 marks for each part)

Use a separate Answer - Script for each part.

PART – I

Answer questions No. 1 &

any **three** from the rest.

1. a) 'A' & 'B' are two steelmaking companies, with the following data. Company 'A' has a no. of 90 ton electric arc furnace (EAF), ladle furnace (LF) & 3 no. of billet casters with 4 strands each. Company 'B' has a no. of 20 ton coreless induction furnace (IF), LF & 2 no. of billet casters with 3 strands each. The charge mix of EAF is 60% DRI & rest steel scrap and that of IF is 10% DRI & rest steel scrap. Operating days for steel melt shop is 320 for both the companies. The yield of billet caster is 99% for company 'A' and 97% for company 'B'. For both the cases the yield of L.F = is 99.5%

Calculate:

- Number of EAF & IF for two companies.
- Billet production for both the companies and their net sales realisation
- Ratio of raw material cost of the two companies.

Data Given :

[Turn Over]

(2)

Tap to tap time for EAF & IF are 90 min & 120 min respectively

For company 'A' casting speed is 3.25 m/min & casting time is 70 min.

For company 'B' casting speed is 2.8 m/min & casting time is 72 min.

The billet size is 130 mm X 130 mm

Cost of DRI is Rs. 16000/ton & that of steel scrap is Rs. 19,000/ton

Selling price of billet is Rs. 25,000/ton

Metallic yield of EAF is 90% & that of IF is 88%

2. Answer to the followings 3x3

- a) Differentiate between
- Vertical -type & S - type Continuous Casting Machine
 - Dry Slag & Wet Slag
 - AC Electric Arc Furnaces & DC Electric Arc Furnace

b) State the role of hot metal composition in selection of Bessemer steelmaking processes. 3

3. Answer to the followings (any three)

- a) Write short note on KALDO process. 3
- b) What is Ladle Furnace? State the uses of it. 3
- c) State the advantages & disadvantages of induction Furnace over conventional Electric Arc Furnace. 4

(3)

d) State the advantages of using lime over limestone in steelmaking. 2

4. Describe a conventional Electric Arc Furnace covering the following items: 3+3+3+3

Furnace Description

Charging, Melting & Arcing

Refining

Desulphurisation

5. How the metal-slag-gas emulsion is formed in LD convertor.

State the relation between emulsion formation & decarburisation in refining in LD convertor

State the importance of secondary steelmaking.

Write short notes on segregation in steel ingot.

2+4+3+3

PART – II

Answer All questions.

6. a) What do you mean by oxidizing potential of slag ? How it affect dephosphorization ? Explain. 5

b) What is Flood's theory of slag ? Explain with the help of 'Mn' reaction. 5

c) Is there any effect of P_{CO} on C – O refining reaction? Explain the limitation of C level during refining in B.O.F. 5

7. a) 'What is the effect of base oxides on 'P' reaction ? Explain on the basis of Flood's theory. 5

[Turn Over]