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Total Number of Pages: 02

B.Tech
PCMT4303

6th Semester Regular / Back Examination 2015-16

IRON MAKING

BRANCH:METTA, MME

Time: 3 Hours

Max Marks: 70

Q.CODE:W109

**Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.**

Q1 Answer the following questions **(2 x 10)**

- a) B/F bosh diameter is more than that of hearth and throat- why?
- b) What do you mean by "dead man zone" in b/f?
- c) An optimum ratio of indirect and direct reduction is required for b/f iron making-justify.
- d) What are the effects of temperature and pressure on Si reaction in b/f?
- e) Arrange the following Iron oxides (lower oxide to higher):
Wustite, Hematite, Magnetite.
- f) What are the conditions for topochemical reduction & Topochemical reduction with diffused interface w.r.t. Diffusion rate=D, Chem reaction rate=R.
- g) Write down two favourable conditions for solution loss reaction.
- h) Define the following terms w.r.t b/f:
 - i> Available base
 - ii> Zero stock line
- i) B/F is the best place for Sulphur removal- Justify.
- j) What is DRI?

Q2 a) Heat capacity of combustion=2300 KCal/Kg C. **(5)**

Heat content of C= 540 KCal.

Heat capacity of air=0.333 KCal /Nm³ °C.

Heat capacity of gas= 0.338Kcal/Nm³°C at 1000°C.

Calculate the RAFT when 1000°C preheated and 25% O₂ enriched air is used.

b) Describe the six internal zones of b/f. **(5)**

Q3 a) Find out the feasibility of FeO reduction by gas containing 70%H₂ and 30%H₂O at 727°C. Given : **(5)**



b) Draw a neat sketch for simplified material flow in and out of a modern B/F. **(5)**
Give the composition of a typical Indian pig iron.

Q4

(10)

Blast furnace produces pig iron of composition Fe 94%, Si 2%, Mn 0.5%, and C 3.5% by reduction smelting of iron ore, coke, and limestone. The analysis is as follows:

Iron Ore : Fe_2O_3 78%, SiO_2 8%, Al_2O_3 5%, MnO 2%, H_2O 7%

Coke: 86% C and 10% S and 4% Al_2O_3 . Amount is 600 kg per ton of pig iron.

Limestone: Pure CaCO_3 to produce a slag of 45% CaO

Calculate:

- Amount of ore/ton of pig iron
- % of total SiO_2 and of the MnO reduced in the furnace
- Amount of slag/ton of pig iron and its % composition.

Q5

(10)

Consider a blast furnace with the following input data (in wt%) with 99.5% reduction and 0.5% slagging off. Find out

- Weight of iron ore required
- Weight and composition of slag

Iron Ore	Fe_2O_3	SiO_2	MnO	Al_2O_3	MgO	P_2O_5	H_2O
	78	8.4	0.6	5	1.2	1.7	5.1
Coke (900kg/t)	C	SiO_2		Al_2O_3			H_2O
	88	9	*	1	*	*	2
Flux (500kg/t)	CaCO_3	SiO_2	MgCO_3				
	96	2	2				
Pig Iron	Fe	C	Si	P	Mn		
	92.7	4	2	0.9	0.4		

Q6 a) How the following factors affect burden distribution in blast furnace **(5)**

- Angle and size of the big bell
- Distribution of charge on big bell

b) Describe the processes of starting and shutting down a B/F for relining. **(5)**

Q7 a) Describe the two bell charging system in B/F. Mention the advantages of bell less charging over bell charging system. **(5)**

b) With a neat sketch describe the SL/RN process in brief. **(5)**

Q8 Write short notes on any two: **(5 x 2)**

- Gas Cleaning Unit
- Hot Blast Stove
- Hanging
- Accretion formation in rotary kiln