

Registration No. :

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Total number of printed pages – 2

B. Tech
PCMT 4303

Sixth Semester Regular / Back Examination – 2015

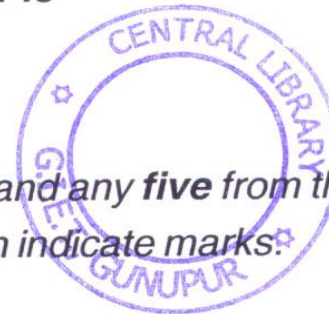
IRON MAKING

BRANCH(S) : MM, MME

QUESTION CODE : J 143

Full Marks – 70

Time : 3 Hours



*Answer Question No. 1 which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
 - (a) How can you evaluate a flux containing 97% CaCO_3 and rest SiO_2 to be used in a blast furnace with basicity 1.5 ?
 - (b) Find out the theoretical Fe content of hematite and magnetite. Which one is preferred in blast furnace and why ?
 - (c) What are the effects of top charging of ore fines on blast furnace operation ?
 - (d) Basicity of bosh slag is higher than final slag in B/F – Justify.
 - (e) What is shortness of slag ? State its importance in blast furnace.
 - (f) Dolomite is a good replacement of lime in fluxed sinter – Justify.
 - (g) What is the effect of oxygen enrichment of blast and high top pressure on Silicon reaction in blast furnace ?
 - (h) Why carbon blocks are used as refractory material in hearth ?
 - (i) What are the effects of temperature and pressure on Boudouard equilibrium reaction ?
 - (j) Why “slag off ” is necessary in LDAC process ?
2. Consider a blast furnace with the following input data (in wt%) with 99.5% reduction and 0.5% slagging off. Find out 10
 - i. Weight of iron ore required
 - ii. Weight and composition of slag

P.T.O.

Iron Ore	Fe ₂ O ₃	SiO ₂	MnO	Al ₂ O ₃	MgO	P ₂ O ₅	H ₂ O
	78	8.4	0.6	5	1.2	1.7	5.1
Coke (900kg/t)	C	SiO ₂		Al ₂ O ₃			H ₂ O
	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		

3. Consider a blast furnace producing pig iron with 95% Fe and 3.6% C consuming 800kg of coke per ton hot metal. If the coke has 85% C and 15% ash, find out the air blast required and blast furnace gas produced with CO:CO₂ ratio 28 :12. 10
4. (a) What is the role of burden distribution inside the B/F on its productivity ? 5
 (b) Construct and comment the plot between RAFT and oxygen enrichment of blast (for 21 to 25% oxygen) at input blast temperature 1000°C from the following data : 5
 Heat capacity of combustion=2300 K Cal/kg C.
 Heat content of C= 540 K Cal.
 Heat capacity of air=0.333 K Cal /Nm³°C.
 Heat capacity of gas= 0.338Kcal/Nm³ °C at 1000°C.
5. (a) Describe the two bell charging system in B/F. Mention the advantages of bell less charging over bell charging system. 5
 (b) Draw a neat sketch for simplified material flow in and out of a modern B/F. Mention functions of coke in B/F. Give the composition of a typical Indian pig iron. 5
6. (a) Describe the physico-chemical reactions taking place in DR processes. Differentiate between Coal based and Gas based DR process 5
 (b) With a neat sketch describe the SL/RN process in brief. 5
7. (a) Describe the processes of starting and shutting down a B/F for relining. 5
 (b) Briefly describe the three stage gas cleaning system in blast furnace plant with suitable sketches. 5
8. Write short notes on any **two** of the following : 5×2
 (a) Molecular theory of slag
 (b) Alumina problem
 (c) Accretion formation in rotary kiln
 (d) Alternative fuels in B/F.

