

MME 2016

(Set-R<sub>1</sub>)

**B.Tech-6th**  
**Iron Making**

Full Marks : 70

Time : 3 hours

**Q. No. 1 is compulsory and answer any five from the rest of the questions**

*The figures in the right-hand margin indicate marks*

**1. Answer all the following questions : 2 × 10**

- (a) What is the percentage of oxygen in hematite, magnetite and wustite?
- (b) What do you mean by blast furnace productivity, explain it with suitable formula?
- (c) Why sponge iron is used for making desired and best quality of steels? What is CSR and CRI?

- (d) Suppose suddenly hearth temperature is reduced due to some reason then what will be the effect of silicon and sulphur content in hot metal? Explain.
- (e) Why instead of coal we are using coke in blast furnace for iron making even if it is abundant in nature? Explain.
- (f) What is tumbling or abrasion test of raw material in iron making and why it is very essential? Explain in details.
- (g) What is critical temperature of the blast furnace? Why it is called critical and why structure of blast furnace is not uniform? Explain.
- (h) What kinds of bonds formed in sintering and how they influence the reducibility and strength?
- (i) What is RAFT? And how it changes with season?

( Turn Over )

- (j) Why it is not recommended to make superfluxed pellets and what do you mean by reducibility of iron ore?

2. Write short notes on the following :  $5 \times 2$

(i) Ferro alloy production and use

(ii) Spong iron making.

3. (a) Suppose you are the in charge of blast furnace section, a new blast furnace is installed in your plant. So explain how you will start a blast furnace and run it up to its campaign life. <http://www.odishastudy.com> 6

- (b) Suppose you are the manager working in a steel plant, one day your boss called you and said, this time we are getting coal with high sulphur content and due to this we are having pig iron with excess sulphur. But our customer want steel with very very low sulphur content. So what necessary steps you have taken into account to get steel with less sulphur content, explain in details. 4

4. What are the techniques adopted in blast furnace for increasing the productivity and reducing the coke consumption in producing pig iron and low silicon content in hot metal. Explain each techniques in details. 10

5. (a) Calculate  $P_{H_2O}/P_{H_2}$  ratio in a  $H_2 - H_2O$  gas mixture and the  $P_{CO_2}/P_{CO}$  ratio in a  $CO - CO_2$  gas mixture at equilibrium with  $a_{Fe} = 10^{-2}$  atm at  $1600^\circ C$ . Also calculate the chemical potential.

GIVEN : For the first gas mixture

$$\Delta G^\circ F = -142625 \frac{J}{MOL}$$

for the second gas mixture.

$$\Delta G^\circ F = -119805 \frac{J}{MOL}$$

- (b) What are the different internal structures internal zones of blast furnace formed during working condition of blast furnace? 4

6. (a) What is conditioning zone and processing zones of blast furnace ? Explain. 6
- (b) Explain the advantages and disadvantages of low shift charcoal blast furnace. 4
7. (a) What are the different chemical reaction occurs inside the blast furnace and categories them into endothermic and exothermic nature. 6
- (b) Write a short note on blast furnace slag, types, composition and its nature. 4
8. (a) What do you mean by driving rate of blast furnace, and high temperature hot blast, and how it is possible to do so ? 6
- (b) Write short notes on the following : 4
- (i) Water particles system in pelletisation
- (ii) Advantages and disadvantages of charcoal blast furnace.