Total Pages—5

(Set-V_1)

B.Tech-6th(M & M)
Refractories and Furnaces

Full Marks : 70

Time : 3 hours

Answer six questions including Q.No.1 which is compulsory

The figures in the right-hand margin indicate marks

Symbols carry usual meaning

1. Answer *all* questions : 2 × 10

(*a*) What is a secondary fuel ? Give few examples.

(*b*) Mention few parameters based on which coal is selected for power plant application.

(*c*) What is ultimate analysis ? What useful information you get by this analysis about a fuel ?

(*Turn Over*)

(*d*) What is a refractory ? As per your study which refractory has maximum refractoriness ?

(*e*) What are special refractories ? Give few examples.

(*f*) Mention the deciding parameters for the selection of refractory for blast furnace hearth.

(*g*) What is the most common source of heat in laboratory furnaces and why ?

(*h*) What is a diffusion flame ? Mention few of its characteristics.

(*i*) What is adiabatic flame temperature ? Mention the factors that affect maximum adiabatic flame temperature.

(*j*) Mention few ways to minimize heat losses in a furnace.

2. (*a*) Briefly explain about the important properties of coal and their significance. 5

(*b*) What do you mean by alternative sources of energy ? Briefly mention the challenges and possible solutions for their wide spread application in matallurgical industries. 5

3. (*a*) Briefly explain the carbonization of coal and the effect of different parameters on it. 5

(*b*) The combustion products of a coal consist of CO_2 : 14·5% , O_2 : 4·7% and N_2 : 80·8% by volume. Calculate the excess air required by percentage for the combustion of coal inside a furnace, if it contains : 5
C : 57.9%, H : 4.4% , S : 0·8 % , N : 11 % , O : 7·9 % , ash : 4·5 % and water : 13·5 %.

4. (*a*) Briefly explain important properties of refractory materials that affect its performance in a furnace. 5

(*b*) Along with reason mention the refractories that are used in different portions of blast furnace, copper converter and heat treatment furnace. 5

5. (*a*) Briely explain the classification of furnaces based on their use. 5

(*b*) Differentiate between flame speed and flame propagation. How they are determined? 5

6. (*a*) Why the combustion needs to be controlled? Briefly explain different modes of combustion control. 5

(*b*) Differentiate between theoretical and true flame temperature. Briefly explain the factors that affect those temperatures. 5

7. (*a*) Differentiate between low and high pressure gaseous fuel burners. Mention their advantages disadvantages and uses. 5

(*b*) What is a calorimeter? Explain the working of Bomb Calorimeter. 5

8. Write short notes on any *two* : 5 × 2

(*i*) Ignition temperature

(*ii*) Carbon refractory

(*iii*) Coking coal.

(*iv*) Fuel atomization.
