



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech(CT)/SEM-5/CT-501/2010-11**

**2010-11**

**REFRACTORIES - I**

Time Allotted : 3 Hours

Full Marks : 70

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for the following :  $10 \times 1 = 10$ 
  - i) During firing, bauxite based bricks undergo
    - a) expansion
    - b) contraction
    - c) no expansion and no contraction
    - d) none of these.
  - ii) Chinese calcined bauxite prefers in H.A. brick composition because it contains
    - a) high  $\text{Fe}_2\text{O}_3$
    - b) low  $\text{Fe}_2\text{O}_3$
    - c) high  $\text{TiO}_2$
    - d) none of these.



- iii) Bulk density of a refractory becomes equal to its true specific gravity when it has
- a) open pores, but no closed pores
  - b) closed pores, but no open pores
  - c) no pores
  - d) none of these.
- iv) Temporary binder used in making burnt dolomite bricks is
- a) dextrine
  - b) carboxymethyl cellulose
  - c) paraffin
  - d) none of these.
- v) Firing cycle of silica brick firing is
- a) one day
  - b) 4 days
  - c) 30 days
  - d) none of these.
- vi) Chemical formula of mullite is
- a)  $2\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2$
  - b)  $2\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2$
  - c)  $\text{Al}_2\text{O}_3 \cdot \text{SiO}_2$
  - d) none of these.
- vii)  $\text{SiO}_2$  content of a good DBMC brick is
- a)  $> 1 \text{ wt } \%$
  - b)  $> 2 \text{ wt } \%$
  - c)  $< 0.8 \text{ wt } \%$
  - d) none of these.
- viii) W.T.A. available in the market contains
- a) 5-7% closed pores
  - b) 5-7% open pores
  - c) 5-7% true porosity
  - d) none of these.



- ix) Chinese fused Magnesia is preferred in brick composition because it has
- low  $\text{SiO}_2$
  - high  $\text{SiO}_2$
  - low  $\text{SiO}_2$  and large grain size
  - none of these.
- x) Usual dimension of Blast furnace bottom blocks is
- $230 \times 115 \times 75 \text{ mm}$
  - $300 \times 150 \times 75 \text{ mm}$
  - $460 \times 230 \times 115 \text{ mm}$
  - None of these.

### GROUP – B

#### ( Short Answer Type Questions )

Answer any *three* of the following.

$3 \times 5 = 15$

- What are sillimanite group of minerals ? Why is Kyanite not used as coarse fraction in H.A. brick composition ?  
 $2\frac{1}{2} + 2\frac{1}{2}$
- Compare the properties of W.T.A. and W.F.A. and their uses in H.A. brick compositions.
- Compare the properties of Sintered Magnesia and Fused Magnesia and their uses in basic brick compositions.
- Define dolomite and dolosinter. How is dolosinter produced from dolomite in the plant ?  
 $2 + 3$
- Define true porosity of a refractory brick. Why % of true porosity can not be measured by boiling method ?  
 $2 + 3$

### GROUP – C

#### ( Long Answer Type Questions )

Answer any *three* of the following.

$3 \times 15 = 45$

- Name different raw materials used in making Silica bricks for Coke oven batteries. Discuss briefly how such bricks are produced in the plant mentioning the physico-chemical changes taking place during firing. State some important properties of Coke oven silica bricks.  
 $3 + 8 + 4$



8. Name different raw materials used in making H.A. bricks. State some of their important properties. A customer has the following requirements :

wt %  $\text{Al}_2\text{O}_3$  – 50 ( min ) ;  $\text{Fe}_2\text{O}_3$  – 1.5 wt% ( max ) ;

% A.P. – 16 ( max ) ; B.D. – 2.45 gms/cc ( min ) ;

C.C.S. — 500 kg/cm<sup>2</sup> ( min ) ; R.U.L. ( ta ) – 1520°C ( min ).

Discuss briefly how you will select the product mix and other process norms to produce the bricks in the plant.

3 + 4 + 8

9. Discuss briefly different physico-chemical properties of different DBSM used in making basic bricks. Discuss briefly how magnesia bricks having 95 wt% MgO ( min ) , 1.5 wt%  $\text{SiO}_2$  ( max ) ; % A.P. – 18 ( max ) ; B.D. – 2.85 gms/cc ( min ) ; C.C.S. – 400 kg/cm<sup>2</sup> ( min ) and R.U.L. ( ta ) – 1650°C ( min ) can be produced in the plant. Why magnesia bricks have poor spalling resistance ?

5 + 8 + 2

10. Define DBMC bricks. How do these bricks differ from conventional Mag-Chrome bricks ? Name different raw materials used for making DBMC bricks. State some important properties of DBMC bricks. Why are DBMC bricks more suitable than any other bricks in copper industry ?

2 + 4 + 2 + 4 + 3

11. Write short notes on any *three* of the following : 3 × 5

- Andalusite as refractory raw material
- Burnt Mag-dolo bricks
- Synthetic refractory raw materials
- Refractoriness under load of a refractory and its importance in refractory performance
- % A.P. of a refractory and its importance in refractory performance.