



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/M.TECH (CT)/SEM-2/M(CT)-202/2010  
2010**

**ADVANCED REFRACTORIES & STRUCTURAL CERAMICS**

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.*

Answer any *five* questions.

5 × 14 = 70

1. Why do ceramic materials differ from metallic and polymeric materials with respect to wear mechanism ? What are the disadvantages of ceramic materials ? What are the factors that affect the wear of ceramic materials ? What are the methods used in laboratory for wear testing of ceramic materials ?  
3 + 2 + 5 + 4
2. Why are  $ZrO_2$  and  $ZrO_2$  bearing oxides used in metallurgical and high temperature chemical engineering industries ? What are the structures exhibited by  $ZrO_2$  and in what temperature are they stable ? How  $ZrO_2$  is partially stabilized and why ? What are the applications of Zirconia ceramics ?  
2 + 3 + 3 + 3 + 3

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[ Turn over



3. What do you mean by pure oxide ? How are pure oxides classified ? State some important properties of pure oxide. Write in brief the general methods of fabrication of pure oxide body.

2 + 2 + 4 + 6

4. Write short notes on the following :

4 × 3  $\frac{1}{2}$

- a) Borillia
  - b) Thoria
  - c) Tin dioxide
  - d) Mechanical properties of pure oxide.
5. What are high alumina refractories ? Name some raw materials used in high alumina refractories. State some of their important properties. Name the raw materials and their preparation to make H.A. bricks with the following properties :

$\text{Al}_2\text{O}_3$  — 70 wt% ( min ),  $\text{Fe}_2\text{O}_3$  — 1.5 wt% ( max )

B.D. — 2.50 gms/c.c ( min ), % A.P. — 16 ( max )

C.C.S. — 500 kgs/cm<sup>2</sup> ( min ) ,

R.U.L (  $t_a$  ) — 1560°C ( min ).

Describe how the bricks are produced in the plant.

2 + 2 + 3 + 3 + 4



6. a) Define Flat and Edge pressing. State the advantages and disadvantages of Edge pressing over flat pressing.

2 + 2 + 4

- b) Calculate the capacity of a hydraulic press to make bricks of size —  $800 \times 150 \times 100$  mm, when the bricks are made by —

- i) flat pressing
- ii) edge pressing.

[ Given, Forming pressure —  $1.9 \text{ tons/cm}^2$  and Efficiency of the press — 85% ].

2 × 3

7. What are  $\text{MgO} - \text{C}$ ,  $\text{MgO} - \text{Al}_2\text{O}_3 - \text{C}$  and  $\text{Al}_2\text{O}_3 - \text{MgO} - \text{C}$  bricks ? Name different types of raw materials used to make each type of brick. Describe briefly how  $\text{Al}_2\text{O}_3 - \text{MgO} - \text{C}$  bricks are produced in the plant. State some of its important properties.

$3 \times 1 + 3 \times 1 \frac{1}{2} + 4 + 2 \frac{1}{2}$

8. What are H.A. cements and H.A. Castables ? How are H.A. castables classified ? Name different raw materials and their proportions to make U.L.C.C.-90 of  $\text{Fe}_2\text{O}_3$  content 0.5 wt % ( max ). State some of its important properties.

2 × 2 + 3 + 4 + 3

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