| | Utech |
|---------------------------|--|
| Name: | |
| Roll No.: | The Property of Managing and Confident |
| 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.

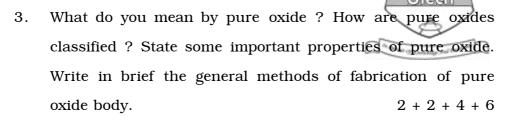
Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. $5 \times 14 = 70$

- 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 ${\rm ZrO}_2$ and ${\rm ZrO}_2$ bearing oxides used in metallurgical and high temperature chemical engineering industries? What are the structures exhibited by ${\rm ZrO}_2$ and in what temperature are they stable? How ${\rm ZrO}_2$ is partially stabilized and why? What are the applications of Zirconia ceramics?

30352 (M.TECH)

[Turn over



- 4. Write short notes on the following: $4 \times 3\frac{1}{2}$
 - 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 inportant properties. Name the raw materials and their preparation to make H.A. bricks with the following properties:

Al
$$_2$$
 O $_3$ — 70 wt% (min), Fe $_2$ O $_3$ — 1·5 wt% (max)
B.D. — 2·50 gms/c.c (min), % A.P. — 16 (max)
C.C.S. — 500 kgs/cm 2 (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 tons/cm 2 and Efficiency of the press — 85%]. 2×3

- 7. What are MgO C, MgO Al $_2$ O $_3$ C and Al $_2$ O $_3$ MgO C bricks? Name different types of raw materials used to make each type of brick. Describe briefly how Al $_2$ O $_3$ MgO 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 Fe $_2$ O $_3$ content 0.5 wt % (max). State some of its important properties.

 $2 \times 2 + 3 + 4 + 3$