Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (CT-OLD)/SEM-3/CT-301/2011-12

2011

INTRODUCTION TO 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.

Graph sheet is provided by institutions.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

   i) Dense high alumina refractories have

      a) high true specific gravity

      b) high bulk density

      c) high % A.P.

      d) none of these.

   ii) Widely accepted raw material used for making basic refractories is

      a) dolo-sinter b) sintered line

      c) dead burnt magnesia d) none of these.

iii) Ordinary Portland cement is usually a mixture of

a) constituent oxides

b) constituent phases

c) both constituent oxides and phases

d) none of these.

iv) Basic refractories have high corrosion resistance against

a) acidic slags

b) basic slags

c) both acidic and basic slags

d) none of these.

v) Ordinary Portland cement clinker is made in rotary kiln at

a) ~ 1450°C b) ~ 1300°C

c) ~ 1800°C d) none of these.

vi) *C*-centered lathic is not possible in case of

a) tetragonal system

b) cubic system

c) orthorhombic system

d) monoclinic system.

vii) A long glass has a large temperature difference between

a) working point and annealing point

b) softening point and annealing point

c) softening point and strain point

d) annealing point and strain point.

viii) A borosilicate glass which has low expansion, the % of B_2O_3 is

a) ~ 13% b) ~ 45%

c) ~ 70% d) none of these.

ix) A typical ion-conducting ceramic is

a) Bismuth doped ZnO

b) Thermistor

c) Lithium niobate

d) Solid electrolyte.

x) Initial setting behaviour in cement paste is attributed by

a) C_3S b) C_2S

c) C_3A d) C_4AF.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Discuss briefly why calcined kyanite cannot be used as coarser fraction in making dense high alumina refractories.

3. How does dolo-sinter differ from dolomite ? Why aqueous binders are not used in making burnt dolomite refractories ?

4. Discuss briefly chemically strengthened glass.

5. Briefly discuss the initial set and hardening process of Portland cement.

6. Draw and label the $Al_2O_3 - SiO_2$ phase diagram in which mullite has been shown to be a congruently melting compound.

GROUP – C

(Long Answer Type Questions)

Answer any *three* questions. 3 × 15 = 45

7. Define refractories. Name different raw materials and their properties used for making high alumina refractories having following specifications :

Chemical	***Physical***
wt% Al_2O_3 — 45 (min.)	B.D. — 2·35 gms/cc (min.)
wt% Fe_2O_3 — 1·5 (max.)	% A.P. — 16 (max.)

Discuss briefly how refractories are manufactured in the plant. 3 + 2 + 3 + 7

8. What do you understand by glass ? Discuss with a diagram how solidification behaviour of glass differs from that for a crystalline material when these materials are cooled from the liquid state. What are the working, softening, annealing and strain point viscosities of glass ? 4 + 5 + 6

9. Name the different raw materials used for making ordinary Portland cement. Discuss briefly how OPC is manufactured in the plant. Name the different phases and their proportion present in the OPC. 2 + 8 + 2 + 3

10. Discuss the fundamental differences between metal and ceramics. How do you proceed to define ceramics both conventionally and from modern concept ? Illustrate with examples. Discuss the advantages and limitations of ceramics. 3 + 4 + 8

11. Why whiteware bodies are also called as fine ceramics ? Draw a triaxial diagram and mark the position of a triaxial body. How triaxial body is compared with the human body ? Draw a process flow sheet of slip house operation for manufacturing of whiteware body. 1 + 3 + 3 + 8