Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (CT)/SEM-3/CT-301/2009-10

2009

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.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) A triclinic system has

a) $a \neq b \neq c$, $\alpha = \gamma = 90° \neq \beta$

b) $a \neq b \neq c$, $\alpha = \beta = \gamma \neq 90°$

c) $a = b = c$, $\alpha = \beta = \gamma \neq 90°$

d) none of these.

ii) The molecular formula of 'Talc' is

a) $3\ MgO\ .\ 4\ SiO_2\ .\ 2\ H_2O$

b) $3\ MgO\ .\ 4\ SiO_2\ .\ H_2O$

c) $MgO\ .\ 3\ SiO_2\ .\ 4\ H_2O$

d) $3\ MgO\ .\ SiO_2\ .\ H_2O$.

iii) Which of the following is the most stable ?

a) Alpha alumina b) Beta alumina

c) Kappa Alumina d) Theta alumina.

iv) Dehydroxylation temperature of kaolinite is

a) 110°C b) 350°C

c) 550°C d) 978°C.

v) Which of the following phases is responsible for the flash set of cement ?

a) C_3S b) C_2S

c) C_3A d) C_4AF.

vi) The specific surface area of Portland cement is

a) 500 – 700 cm^2 /gm

b) 2000 – 3000 cm^2 /gm

c) 5000 – 7000 cm^2 /gm

d) 10000 – 12000 cm^2 /gm.

vii) Which of the following is pozzolana ?

a) Calcined clay b) Rice husk

c) Pulverised fly ash d) All of these.

viii) Which of the following oxides is not a glass former ?

a) SiO_2 b) B_2O_3

c) GeO_2 d) Cr_2O_3 .

ix) The stoneware is a

a) crude salt glazed porcelain made from cheaper grade raw material

b) thoroughly vitrified translucent ware with a hard glaze

c) porous semivitreous ware with a soft glaze

d) vitrified translucent ware with a soft glaze.

x) The filter press is mainly used in

a) making of refractories

b) ceramic insultor making

c) cement making

d) glass making.

GROUP – B

(Short Answer Type Questions)

Write short notes on any *three* from the following. 3 × 5 = 15

2. Ceramic glaze.
3. Different shaping methodologies of ceramic whitewares.
4. Zachariasen's model for glass formation.
5. Limitations of ceramics.
6. Monolithic refractories.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. Classify materials. Classify ceramics. Show triaxial body in a triaxial diagram. Classify whitewares. Draw a process flow-chart of slip-house operation. 2 + 3 + 3 + 3 + 4

8. What do you understand by pozzolana ? How are pozzolanas classified ? What are the raw materials used for the manufacture of ordinary Portland cement ? What are the phases present in OPC ? Which phase is responsible for flash set ? Why is gypsum added in cement as retarder ? Why is cement called hydraulic binder ? What types of kilns are used for OPC manufacture ?

2 + 1 + 2 + 2 + 2 + 2 + 2 + 2

9. Define glass. Enumerate the similarities and dissimilarities between a glass and a ceramic. Discuss with a sketch how the solidification behaviour of glass differs from that of for a crystalline material when these materials are cooled from the liquid state. Draw the viscosity-temperature curve for glass and indicate on it the working, softening, annealing and strain point viscosities of glass mentioning their values.

4 + 2 + 4 + 5

10. What are the criteria for selection of quartzite as a raw material for the manufacture of Silica refractories ? Discuss the 'binders' and 'additives' added during silica brick manufacture. Where do silica bricks find applications ?

4 + 4 + 4 + 3

11. a) Define ceramics. Discuss the fundamental differences between a metal and a ceramic. Enumerate the distinctive advantages of ceramics. 2 + 2 + 4

    b) State the applications with at least one example for the following functions and properties : 7

    i) Thermal insulation
    ii) Non-linear I-V characteristics
    iii) Soft magnets
    iv) Translucency and chemical inertness
    v) Nuclear fission
    vi) Biocompatibility
    vii) Hardness.