



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH(CT)/SEM-3/CT-301/2010-11**

**2010-11**

**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 × 1 = 10

- i) End-centered lattice is not possible in case of a/an
  - a) Isometric system      b) Tetragonal system
  - c) Orthorhombic system   d) Monoclinic system.
- ii) Which of the following is not a characteristic property of ceramic material ?
  - a) High temperature stability
  - b) Low hardness
  - c) Low elongation
  - d) High mechanical strength.





**GROUP – B**

**( Short Answer Type Questions )**

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

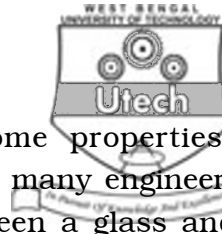
2. What are the kilns used for cement manufacturing ? Which one is more economical and why ? 2 + 3
3. State the Zachariasen's rules of glass formation.
4. Classify traditional ceramic materials.
5. Classify refractories.
6. Draw Binary  $\text{Al}_2\text{O}_3$ – $\text{SiO}_2$  diagram with mullite as congruently melting solid. Mark the phase fields.

**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. What are the basic components of traditional white wares ? What roles do these components play in white ware bodies ? Describe some white ware classes and products. Give the flow sheet showing sequence of unit operations to produce Bone China ( slip cast ) wares and wall tiles. 2 + 2 + 5 + 3 + 3
8. What are the processes used for cement manufacturing ? What are the advantages and disadvantages of these processes ? What do you understand by silica modulus, iron modulus and chemical modulus ? What can you guess from silica modulus ? 2 + 5 + 6 + 2
9. What are the criteria for selection of magnetite as a raw material for magnesia refractories ? What are the varieties of basic refractories ? Point out the influence of  $\text{Cr}_2\text{O}_3$  on properties of magnesia refractories. Discuss the effect of  $\text{Fe}_3\text{O}_4$  and  $\text{Al}_2\text{O}_3$  content on HMOR of such refractories. Discuss the influence of  $\text{CaO} : \text{SiO}_2$  ratio on magnesia refractories micro-structure. 4 + 3 + 2 + 2 + 4



10. Give definitions of glass. What are some properties of glasses that make them indispensable for many engineering designs ? How do you differentiate between a glass and a ceramic material ? Discuss with a diagram how the solidification behaviour of glass differs from that for a crystalline material. What are the working point and strain point viscosities of glass ?

4 + 2 + 3 + 4 + 2

11. a) Define ceramics giving emphasis on periodic classification of elements. Give 2 examples to justify that those are ceramic materials.
- b) Discuss some severe limitations of ceramics even though they possess some remarkable properties.
- c) Suggest at least one ceramic material used for the following applications :
- i) Infrared laser windows
  - ii) Tritium breeder materials
  - iii) Current surge protectors
  - iv) Wear resistant bearings
  - v) Neutron moderators
  - vi) Artificial joint prosthesis
  - vii) Switching devices for optical computing
  - viii) Heat sinks for electronic packages.

( 2 + 2 ) + 3 + 8

12. What are ceramic glazes ? Discuss the desired properties of a glaze slip. What are 'Raw' and 'Fritted' glazes ? What are the advantages of fritted glazes ? Discuss the steps required for enamelling a metal plate.

2 + 5 + 3 + 3 + 2

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