



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.TECH (CT-OLD)/SEM-4/CT-401/2012**

**2012**

**CERAMIC RAW MATERIALS**

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) Which of the following clay minerals has Zero CEC value ?
  - a) China clay
  - b) Bentonite
  - c) Mica
  - d) None of these.
- ii) Which of the following is the purest and thermally stablest form of alumina ?
  - a) Alpha alumina
  - b) Beta alumina
  - c) Gamma alumina
  - d) None of these.
- iii) Crystallite size is measured by
  - a) Linear intercept method
  - b) XRD method
  - c) BET method
  - d) None of these.



- iv) The end product of heated kaolinite is
  - a) Alumina and Mullite
  - b) Mullite and cristoballite
  - c) Metakaoline
  - d) None of these.
- v) Which of the following is reactive towards hydration
  - a) dead burnt Magnesia
  - b) caustic Magnesia
  - c) Zirconia
  - d) None of these.
- vi) The tetragonal to monoclinic transformation of Zirconia is
  - a) not desirable
  - b) very much desirable
  - c) not affect any property
  - d) none of these.
- vii) Thermally stable polymorph of  $\text{SiO}_2$  is
  - a) Quartz
  - b) Cristoballite
  - c) Tridimite
  - d) None of these.
- viii) Which of the following is piezoelectric ceramics ?
  - a)  $\text{BaTiO}_3$
  - b) Ferrite
  - c)  $\text{MgO}$
  - d) none of these.
- ix) The example of 2 : 1 clay mineral is
  - a) Kaolinite
  - b) Ball Clay
  - c) Montmorilonite
  - d) None of these.
- x) Which of the following has spinel like structure ?
  - a) Quartz
  - b) Beta Alumina
  - c) Gamma Alumina
  - d) None of these.



**GROUP – B**

**( Short Answer Type Questions )**

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

2. Discuss the structural stability of barium titanate. How barium titanate is prepared by modified Pachini process ?

2 + 3

3. What fluxing materials are used in ceramic industry ? How soda feldspar differs from potash feldspar on nitrification ?

2 + 3

4. Give a descriptive flow chart for the preparation of  $Y_2O_3$  stabilized  $ZrO_2$  powder by precipitation technique. How *c/t* phase ratio would be increased ?

3 + 2

5. How DTA help to explain the calcination techniques of clay and dolomite samples ?

6. What is cation exchange capacity ? How it is expressed ? Mention the factors on which CEC of a materials depends.

1 + 1 + 3

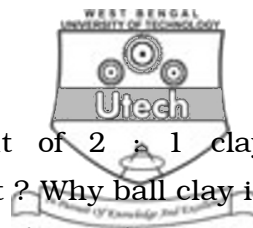
**GROUP – C**

**( Long Answer Type Questions )**

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

7. Discuss the displacive and reconstructive type of transformation in silica polymorphs. What type of mineraliser are used for such transformation ? Discuss their role. How quartz differs from quartzite ? What is vitreous silica and how it is prepared ?

5 + 1 + 3 + 2 + 4



8. Show schematically atomic arrangement of 2 : 1 clay minerals. How mica structure differ from it ? Why ball clay is more plastic than china clay ? Why fire clay is known as refractory clay ? How sillimanite, kyanite and andalusite differ from each other ? Why montmorillonite shows swelling in water ?

4 + 2 + 2 + 2 + 3 + 2

9. Discuss the advantages and disadvantages of sol-gel process. What are the basic principles of sol-gel process ? Show a descriptive flow chart for the manufacture of silica glass fibre from TEOS by sol-gel process. Discuss the process variable of this synthesis.

4 + 4 + 4 + 3

10. Why soad content in alumina play a vital role for the quality of alumina ? Discuss the role of mineralizer to reduce the soda content in Bayer  $\text{Al}_2\text{O}_3$ . How pure mullite is obtained from silica sol and fume alumina ? Describe the particle size and morphology of powder obtained. Mullite is compound or solid solution. Justify.

2 + 5 + 4 + 2 + 2

11. What are the precursors used for the preparation of MAH powder by solution precipitation techniques ? How would you prepare co-precipitated magal spinel ? Discuss the effect of calcination temperature and seeding techniques for spinelisation. How  $\text{MgAl}_2\text{O}_4$  powder is prepared by alkoxide rotue ?

3 + 4 + 4 + 4