

**II B.Tech I Semester Regular Examinations, November 2005**  
**CERAMIC SCIENCE AND TECHNOLOGY**  
**(Metallurgy & Material Technology)**

**Time: 3 hours****Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. Write short notes on:
  - (a) structural ceramics and their applications. [8]
  - (b) ceramics - their advantages and disadvantages over metals. [8]
2. (a) List three important bioceramics and their applications. [6]  
(b) How are magnetic ceramics classified? Discuss the different classes with examples. Mention one application for each class. [10]
3. (a) How do you compare ceramics and non ceramic phases? [6]  
(b) Describe silicon-oxygen tetrahedron ( $\text{SiO}_4$ ) structure and double poly-tetrahedron structures of ceramics. [10]
4. (a) For the  $\text{MgO} - \text{Al}_2\text{O}_3$  system, what is the Maximum temperature that is possible without the formation of a liquid phase. At what composition or over what range of composition will this maximum temperature be achieved. [8]  
(b) Explain the eutectic reaction in the  $\text{SiO}_2 - \text{Al}_2\text{O}_3$  phase diagram between  $\text{SiO}_2$  and Mullite. [8]
5. List the powder preparation techniques for advanced ceramics and explain them briefly. [16]
6. Explain the following:
  - (a) Plasma sprayed stabilized Zirconia coatings. [8]
  - (b) Plasma sprayed Titanium Diboride coating. [8]
7. (a) Explain extrusion mechanics with suitable sketches. [7]  
(b) Describe deformation in extrusion, possible defects and their control. [9]
8. (a) Explain microwave processing of ceramics. [9]  
(b) What are the advantages and limitations of microwave processing? [7]

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1. Write short notes on:
  - (a) Refractory ceramics and their characteristics. [6]
  - (b) Magnetic ceramics and their applications. [5]
  - (c) Magnetic ceramics and their applications. [5]
2. Write detailed notes on: [8+8]
  - (a) piezo electric ceramics and
  - (b) conducting ceramics.
3. (a) What are the features of glass? [4]  
(b) Distinguish between soda lime or crown glass and flint glass. [12]
4. (a) Define the terms Stoichiometric and Phase Boundary. [6]  
(b) Draw a neat sketch of  $\text{Al}_2\text{O}_3$  -  $\text{SiO}_2$  Equilibrium Diagram and explain. [10]
5. (a) Explain the formation of glassy silica by Sol- gel processing. [6]  
(b) Discuss the preparation of advanced ceramics by Sol-gel technique. [10]
6. Explain the following:
  - (a) Plasma sprayed stabilized Zirconia coatings. [8]
  - (b) Plasma sprayed Titanium Diboride coating. [8]
7. (a) Describe ejection and transfer of compacts. [8]  
(b) Explain methods for preparing ceramic raw materials for processing. [8]
8. (a) Explain ultrasonic machining. [6]  
(b) Compare ultrasonic machining with conventional methods. [10]

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1. (a) Which ceramic material will you choose for the following applications? Justify your choice: [10]
  - i. automobile engine parts
  - ii. mining tools
  - iii. computer heat sinks
  - iv. high temperature insulation
- (b) What are oxide ceramics? Explain with examples. [6]
2. (a) What are the important requirements of dielectric ceramics? Give the important dielectric ceramics and mention their applications. [8]
- (b) Give a detailed account of spinels, cubic and hexagonal ferrites. What are their important applications? [8]
3. (a) What are the uses of glass? [4]
- (b) Explain leaded glass and phosphate glass. [12]
4. (a) Define the terms Phase and Isotherms. [4]
- (b) Draw a neat sketch of BaO -TiO<sub>2</sub> Equilibrium Diagram and explain. [12]
5. (a) Explain the formation of glassy silica by Sol- gel processing. [6]
- (b) Discuss the preparation of advanced ceramics by Sol-gel technique. [10]
6. (a) Distinguish between the following: CVD and PVD processes. [8]
- (b) What are the specific advantages of plasma sprayed coatings over other types of coatings? Explain the necessary reasons. [8]
7. (a) Describe injection molding with neat diagrams. [8]
- (b) Discuss the advantages and draw backs of injection moulding. [8]
8. With the help of a neat sketch explain the working principle of the major components of an ultrasonic machine. [16]

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1. (a) What are ceramics? How are ceramics classified based on composition? Give examples. [7]  
(b) Give the characteristics of the following ceramics with applications:
  - i. Porcelains
  - ii. Refractories
  - iii. Glass[9]
2. (a) List three bioceramics for use in human body. Give their advantages, disadvantages and applications. [9]  
(b) How are bioceramics classified? Explain with examples. [7]
3. (a) What are the developments of ceramics? [6]  
(b) Describe frame structure and vitreous structure of ceramics. [10]
4. (a) Define the terms Stoichiometric and Phase Boundary. [6]  
(b) Draw a neat sketch of  $\text{Al}_2\text{O}_3$  -  $\text{SiO}_2$  Equilibrium Diagram and explain. [10]
5. Explain the advantages of sol-gel process over other methods. Write an essay on the sol-gel process for the production of various advanced ceramic powders; silica fibres and glasses. [16]
6. Write an essay on 'Indian fine ceramic powder industry'. [16]
7. (a) Describe ejection and transfer of compacts. [8]  
(b) Explain methods for preparing ceramic raw materials for processing. [8]
8. (a) What are the main objectives of forming processes and explain them. [7]  
(b) Explain in detail various cold forming and hot forming methods of ceramics. Discuss the advantages and limitations of them. [9]

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