Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CT)/SEM-7/CT-702/2012-13

2012
ADVANCED CERAMICS-II

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 Ferrites has positive value of saturation magnetization ?

   a) Fe_3O_4 b) $MnFe_2O_4$

   c) $CoFe_2O_4$ d) $NiFe_2O_4$.

   ii) The "Bloch Wall" is associated with

   a) Electrical Properties b) Magnetic Properties

   c) Mechanical Properties d) Thermal Properties.

   iii) 'Actuator' is associated with

   a) Ferro electricity b) Piezoelectricity

   c) Ferromagnetism d) Superconductivity.

iv) Which of the following materials is not an Electrooptic Ceramic material ?

a) $LiNbO_3$ b) $LiTaO_3$

c) PZT d) PLZT.

v) Which of the following materials is used as 'Barrier Layer Capacitor' ?

a) $CaZrO_3$ b) Quartz

c) SIALON d) AIN.

vi) Which of the following Ferrites is used in Computer memory Core ?

a) Ni-Zn Ferrite b) Mg-Mn Ferrite

c) Cu-Zn Ferrite d) Cu-Mg ferrite.

vii) Which of the following natural materials is used as a Dielectric ?

a) Vermiculite b) Bentonite

c) Halloysite d) Mica.

viii) Which of the following materials is piezoelectric ?

a) Corundum b) Quartz

c) Carborundum d) Diamond.

ix) Which of the following materials can be used as Accelerometer ?

a) Cordierite b) PZT

c) Steatite d) Y-Ba-Cu-O.

x) Which of the following is a permanent magnet ?

a) Zinc ferrite b) Nickel ferrite

c) Barium ferrite d) Manganese ferrite.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What are steatite ceramics ? State the advantages and disadvantages of steatite ceramics in electrical applications. Why spinel is not used in electrical applications in spite of its high insulating property ? 1 + 3 + 1

3. "Reducing the grain size of barium titanate ceramics below 1 μm in diameter has a flattening effect on capacitance versus temperature." Explain.

4. Explain the advantages of thin film capacitor over thick film capacitor. What are the different techniques followed to fabricate thin film capacitor ? 3 + 2

5. Explain the differences between direct piezoelectricity and converse piezoelectricity giving examples.

6. "Addition of zinc ferrite to manganese ferrite raises its saturation magnetization". Explain.

GROUP – C

(Long Answer Type Questions)

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

7. What is the consequence of addition of lanthanum oxide to PZT system ? What is the general composition of PLZT materials ? What are the different categories of PLZT ceramics based on their applications ? With a flow sheet describe chemical co-precipitation process for the fabrication of PLZT ceramics. 4 + 2 + 4 + 5

8. Explain crystalline anisotropy and magnetostriction in ferrites. With a flow sheet describe the standard processing of ferrite components. 10 + 5

9. Write short notes on any *three* of the following : 3 × 5

   a) Barrier layer capacitor

   b) Z5U dielectrics

   c) Butterfly loop ion ferroelectric ceramics

   d) Hexagonal ferrite

   e) Factors affecting dielectric strength

   f) Barium titanate ceramic.

10. Explain the various types of defects in non-stoichiometric oxides. What are different diffusion mechanisms in electronic ceramics ? 7 + 8

11. Explain the phenomenon of optical phase retardation in electro-optic ceramics. Discuss the roles of different additives on the properties of piezoelectric ceramics. 6 + 9