Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (CT)/SEM-6/CT-604/2010

2010

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 : $10 \times 1 = 10$

   i) Soft ferrite is used for inductor or core materials for transformer because

      a) low electrical resistivity

      b) high electrical resistivity

      c) high oxidation resistance

      d) low oxidation resistance.

   ii) Binder used for consolidation of $MoSi_2$ is

      a) Resin b) Cornflour with water

      c) PVA d) Molasses.

   iii) Sintering at cements is usually carried out in

      a) oxidising atmosphere

      b) reducing atmosphere

      c) neutral atmosphere.

iv) Mechanical properties of graphite improve at elevated temperature because of

a) oxidation

b) reduction

c) increased disorderness

d) increased orderness.

v) In graphite % of disordered carbon is

a) 5 b) 10

c) 15 d) 20.

vi) SOFC contains ..... conducting electrolyte.

a) H^+ ion b) O^- ion

c) none of these d) all of these.

vii) The main application of Zirconia ceramics is in

a) THR ball head

b) Teeth filler

c) Bioresorbable materials

d) none of these.

viii) Boron carbide is one of the hardest materials, ranking 3rd behind diamond and

a) Si_3N_4 b) WC

c) Cubic BN d) Hexagonal BN.

ix) SiC is used as

a) cutting tools b) heating elements

c) none of these d) all of these.

x) ..... bond predominates in non-oxide ceramics.

a) Ionic b) Covalent

c) None of these d) All of these.

GROUP – B

(Short Answer Type Questions)

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

2. What do you mean by graphitic carbon ? Thermal expansion coefficient (α) of graphite is higher in *c*-axis but low in *AB* plane (*x*-axis) whereas electrical and thermal conductivities show the reverse results. Why ? 1 + 4

3. What do you mean by cermets ? In what ways cermets differ from the traditional refractories ? 2 + 3

4. What are the methods used for synthesis of Boron Nitride ? Why greasy feel appear in Boron nitride ? 3 + 2

5. Compare the properties of Si_3N_4 with those of SiC.

6. Discuss about honeycomb type SOFC.

7. Write applications of boron carbide.

GROUP – C

(Long Answer Type Questions)

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

8. "Silicides are closely related to intermetallic compounds." Explain. Describe in detail the method of manufacturing of $MoSi_2$ including thermal nature of the process. Write the important applications and limitations of metal silicides. 4 + 6 + 3 + 2

9. What do you mean by magnetic ceramics ? Mention the types of magnetic materials. Discuss in brief the processing methods of ferrites. Write in brief the chemical composition and crystal structure of magnetic ceramics. 2 + 2 + 6 + 5

10. What do you mean by white graphite and borazone ? How industrially very pure BN is manufactured ? In what ways Si_3N_4 product is manufactured ? What are the industrial and engineering applications of Sialon ? 2 + 5 + 4 + 4

11. Discuss about the manufacturing process of silicon nitride ceramics. Discuss about the uses of silicon nitride ceramics. Discuss about the manufacturing processes of Titanium carbide and Boron carbide. 6 + 3 + 6

12. What is bioceramics ? How many types of bioceramics exist as per the choice of materials ? Discuss the applications of bioglass and glass ceramic materials in biomedical engineering. Write brief, about the properties of dental porcelain. How dental ceramics are classified based on the nature of supporting structure ? State why the supporting structure is necessary. 1 + 1 + 5 + 5 + 1 + 2

13. State the working principle of SOFC with schematic representation and reaction. If you are told to choose a material for SOFC anode, then what properties are you going to consider ? Discuss about the properties of SOFC cathode and electrolyte. Discuss about the advantages of symmetrical SOFC. Write down the advantages and disadvantages of planar and tubular SOFC. 4 + 2 + 4 + 2 + 3