Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech(CT)/SEM-2/M(CT)-204-B/2012

2012

BIOCERAMICS

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) In order for bone in growth to occur, the surface of implant must be

      a) smooth b) porous

      c) abrasive d) adhesive.

   ii) What material coating helps the body to accept titanium implants ?

      a) Hydrogenated fat b) Hydrochloric acid

      c) Hydroxyapatite d) Hydrangea.

   iii) Which are the two forms of calcium phosphate ceramics receiving most attention ?

      a) HA and Alpha Tri-calcium phosphate

      b) Apha and Beta Tri-calcium phosphate

      c) Beta Tri-calcium phosphate and HA

      d) None of these.

iv) Which property below would you NOT associate with the metals used to make the ball section of the hip joint ?

a) High ductility b) Wear resistance

c) High tensile strength d) Sturdiness.

v) Which of the following materials in not used to build the ball section of a hip joint ?

a) Chromium b) Cobalt

c) Silicon d) Titanium.

vi) HAP may be produced by

a) wet chemical method

b) hydrothermal method

c) hydrolysis of other calcium

d) all of these.

vii) Biphasic calcium phosphate consists of

a) α-TCP and β-TCP

b) HA and β-TCP

c) tetracalcium phosphate (TTCP) and HA

d) all of these.

viii) One of the key property of HAP is

a) it is a thermally stable compound

b) it has good mechanical strength

c) it has ability to integrate in bone structures and support bone in growth without breaking down

d) all of these.

ix) Biomaterial used in spinal fusion device is

a) Al_2O_3 b) bioglass

c) PSZ d) HAP.

x) What are Biphasic Calcium Phosphate (BCP) ceramic material ?

a) Alpha Tri-calcium Phosphate

b) Beta Tri-calcium Phosphate

c) Gamma Tri-calcium Phosphate

d) None of these.

GROUP – B
(Short Answer Type Questions)

Write short notes on any *three* of the following. 3 × 5 = 15

2. Collagen as cell-based bone graft substitute.

3. Porous ceramics in connections with use as bioceramics.

4. Synthesis of bioactive glasses.

5. Calcium orthophosphate as bioceramic material.

6. Bio-composite materials.

GROUP – C
(Long Answer Type Questions)

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

7. What do you understand by Diamond like carbon (DLC) ? Enumerate the distinctive properties and features of DLCs and that make them highly interesting for use as medical implants. Discuss the various bio-applications of DLC. Describe the methods of producing DLC coating on a substrate. 2 + 3 + 6 + 4

8. Name some ceramic materials used in biomedical applications. Discuss some of the mechanical properties. Compare natural bone with synthetic hydroxyapatite in respect of some mechanical characteristics. Briefly discuss the commercial synthesis of hydroxyapatite. 4 + 3 + 3 + 5

9. Discuss 'Bioactive Glasses'. Describe the interfacial reaction kinetics and stages of formation of bond between bone and a bioactive glass. What are 'Loaded Bioactive glasses' ?

3 + 10 + 2

10. Define biomaterials, biological materials, biomimetric materials and bioceramics along with examples. Why replacement of bones are needed for human ? Classify bioceramics. State different implement-tissue response. Discuss various types of tissue attachment with suitable example. How is Hydroxyapatite different than Beta Tri-calcium phosphate ? 3 + 2 + 3 + 2 + 3 + 2

11. Discuss clinical significance of dental ceramics in respect of different type of restorations. Explain briefly structure of a tooth. Discuss ceramic materials used in dental ceramics and its manufacturing process. 4 + 5 + 6