



B.E / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL-MAY 2012

MATERIALS SCIENCE AND ENGINEERING BRANCH

SIXTH SEMESTER - (REGULATION 2008)

ML 9351 – BIO AND SMART MATERIALS

Time: 3 hr

Max.Mark:100

PART- A (10X2 = 20 Mark)

(Note: Answers without justification will not carry marks)

Arrange the following in a most appropriate logical sequence and justify:

1. Foreign body giant cells, Mononuclear Leukocytes, Macrophages, Polymorphonuclear Leucocytes.
2. Nylon-11, poly (vinylidene fluoride)(PVDF), Lead Zirconate Titanate(PZT), Quartz, collagen
3. Shape memory (SM) Alloys, SM polymers, Magnetic SM Alloys
4. Hydroxyapatite, β - tri calcium phosphate (TCP), α - TCP, Bio-glass, Poly lactic acid
5. Vitreous humor, corneal epithelium, aqueous humor, iris, retina

Pick the odd man of the series and justify.

6. Piezoelectric, magnetostrictive, electrostrictive and electrorheological (ER) materials.
7. Interfacial, ionic, dipole, atomic and electronic polarization in case of ER fluids.
8. Ni-Ti cladding of hydraulic machinery, Medical tools and devices (open heart surgery), ski materials to damp vibrations and stents.
9. Heparin, Poly(ethylene oxide), albumin, Prostacyclin and Thrombomodulin
10. Blades, staples, root form, abutment and denture.

PART- B (5 X16 = 80 Mark)

11. Brief on the mechanism of shape memory effect exhibited by following materials:

- | | |
|----------------------------|-----|
| (i) Nitinol | (8) |
| (ii) Shape memory polymers | (8) |

12. (a) Brief on the intelligent inheritance to materials for delivering the primitive functions of intelligent materials.

(OR)

(b) Brief on the various host reactions to biomaterial with respect to cell(s) involved, time duration and signals/mediators/release.

13. (a) (i) Brief on the various mechanisms of ER property. (10)
(ii) What are the desired characteristics of ER particles for better ER effect? (3)
(iii) List the advantages of Magnetorheological fluid over ER fluid. (3)

(OR)

- (b) Explain the mechanism of piezoelectric effect in:
(i) PZT (6)
(ii) PVDF (6)
and
(iii) Brief on any ONE application of piezoelectric material as actuator. (4)

14. (a) Brief on any FOUR defects in skeletal systems as well as choice of materials and/or methods of restoration and/or replacement.

(OR)

- (b) Emphasize the importance selection of materials for blood contact application with any FOUR examples.

15. (a) Discuss on any TWO common defects and choice of materials and methods of restoration /replacement in :

- (i) tooth/oral structure (8)
(ii) skin structure (8)

(OR)

- (b) (i) Elaborate on the desired properties of materials for ophthalmological application with any TWO examples. (7)
(ii) Brief on the mechanisms involved in any THREE types of drug delivery system. (9)

----- *All the best* -----