

B. E. (Met) 7th Semester Final Examination 2012

Nanostructured and Functionally graded materials.
(MT – 705/1)

Full marks: 70

Time 3hrs

(Use separate answerscriptfor different sections)

SECTION A

(Answer any five questions)

- Q1. Explain why HRTEM images of nanostructured materials should be interpreted carefully. (7)
- Q2. Explain why the specific heat capacity and thermal conductivity of nanocrystalline materials is different from their coarse grained counterparts. (7)
- Q3. Explain how the crystal sizes of nanocrystalline ZnO affect its luminescence property. (7)
- Q4. Explain why the chemical binding effects at the grain boundaries of diamond like structures changes with decreasing grain size. (7)
- Q5. With reference to the rapid expansion of supercritical fluid solution, explain how hydro-thermal synthesis technique is used to prepare nanocrystalline materials. (7)
- Q6. State and explain the conditions required for preparing a super-lattice structure of Cu/Ni is over a conducting substrate by employing electro-deposition technique. (7)
- Q7. State the use and importance of SPION's in the biomedical field. (7)

SECTION B

- Q7. Answer any two : (7½ x 2)
- (i) Describe the favourable condition for glass forming ability of metallic alloys.
 - (ii) Describe the variation specific volume as the function of temperature for crystalline and amorphous alloys indicating the variation of T_g for different cooling rates.
 - (iii) Enumerate the conditions for appearance of glass transition in terms of a binary phase diagram comprising two terminal eutectics and an intermediate phase.
 - (iv) Enumerate the technological properties of glass in the light of its featureless microstructure

Q8. Compare and contrast (any two) (5×2)

- (i) Glass and supercooled liquids
- (ii) Strong and fragile glass
- (iii) Atomic mobility in amorphous and crystalline alloys
- (iv) Plasticity in crystalline and glassy alloys

Q9. Write short notes (any two) (5×2)

- (i) VTF equation
- (ii) Kauzmann's Paradox
- (iii) Submerged eutectic
- (iv) Reduced glass transition temperature
