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10NT44

Fourth Semester B.E. Degree Examination, June/July 2015
Properties of Nano Materials

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain how quantum size effects affect the melting point and phase transition processes. **(08 Marks)**

b. Write a short note on nano scale magnets and transparent magnetic materials. **(05 Marks)**

c. What is metal – insulator transition? Give a theoretical description. **(03 Marks)**

d. What are atomic and molecular clusters? Explain. **(04 Marks)**

2 a. Explain the importance of surface – volume ratio in general properties of nano materials. **(03 Marks)**

b. What is surface energy? Explain its importance. **(07 Marks)**

c. Write a note on electrostatic stabilization. **(05 Marks)**

d. Explain about the electric potential at the proximity of a solid surface. **(05 Marks)**

3 a. Define photo chemistry and photo conductivity. Add a note on the applications of nano catalysis. **(04 Marks)**

b. Explain about the significance of nanoscale heat transfer. **(03 Marks)**

c. What are the advantages of catalysis by Au-nanoparticles? Brief on benefits of nanocatalysts in chemical industry. **(03 Marks)**

d. Explain briefly about the catalysis by gold nano particles. **(10 Marks)**

4 a. Explain about fracture mechanics. **(05 Marks)**

b. What are the factors affecting the fracture toughness? **(04 Marks)**

c. Discuss the Weibull statistics for failure strength analysis. **(05 Marks)**

d. Write a note on micro structural features of fracture in polymers and composites. **(06 Marks)**

PART – B

5 a. Write a short note on micro structure. **(03 Marks)**

b. Explain about grains and grain boundaries. **(06 Marks)**

c. Explain the Hall – Petch relation. What is reverse hall – Petch relation? **(06 Marks)**

d. What is diffusion? Explain about solid solution strengthening. **(05 Marks)**

6 a. Explain the electrochemical corrosion with an example. **(06 Marks)**

b. Suppose that in a corrosion cell composed of copper and zinc, the current density at the copper cathode is 0.05 A/cm^2. The area of the electrode is 100 cm^2. Calculate the corrosion current and metal loss per hour. (Atomic mass of zinc is 65.38 g/mol). **(05 Marks)**

c. What is inter granular corrosion? Explain with examples. **(03 Marks)**

d. Write a brief note on wear. **(06 Marks)**

7 a. What are ferroelectricity and ferroelectric materials? Explain briefly the applications of ferroelectric materials. **(10 Marks)**

b. Explain dielectric, paraelectric, and ferroelectric polarization. **(06 Marks)**

c. Write a short note on ferro electric domain. **(04 Marks)**

8 a. Write a note on domain theory of ferromagnetism. **(05 Marks)**

b. What are ferromagnets? Explain. **(04 Marks)**

c. Explain about Bloch wall what is the difference between Bloch and Neel wall? **(05 Marks)**

d. Explain about the origin of magnetism and its classifications. **(06 Marks)**

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