



B.E/B.Tech (Full-Time) DEGREE END SEMESTER EXAMINATIONS, NOV/DEC2012
MATERIALS SCIENCE AND ENGINEERING BRANCH
FIFTH SEMESTER-REGULATION 2008

ML9305 INTRODUCTION TO NANOTECHNOLOGY

Time: 3Hr

Max.Mark:100

Answer ALL Questions

Part -A (10x2=20 Marks)

- 1. Distinguish between "top-down" and "bottom-up" approach used in nanofabrication
- 2. What is the bio-inspired technique you learned from Lotus leaf?
- 3. Berkovich tools tool tip is normally used for nanoindentation test. Why?
- 4. What is "Tapping mode" in AFM?
- 5. Draw the three types of architecture in CNT.
- 6. List out the defects in CNTs?
- 7. Mark the Hall-Petch and Inverse Hall-Petch" region in grain size Vs hardness Curve and mention the strengthening mechanism in each region.
- 8. What are the reliability issues associated with ball milling?
- 9. What are Superhard coatings?
- 10. Mention the applications of mesoporous nanostructured Materials.

Part - B (5x16 = 80 Marks)

- 11 (i) Describe nanoindentation characterization technique. (8)
- (ii) Discuss the factors that affect the nanoindentation (8)
- 12a (i) Explain the principle of AFM. Explain in detail the different eigen modes of AFM cantilever during working (16)
- OR
- 12b (i) Explain the working principle of STM. (6)
- (ii) What is quantum confinement effect? Explain the method of fabrication of quantum dots by droplet epitaxy technique (12)
- 13a (i) Explain the mechanism by which super hardness can be achieved. Discuss the different methods to assess the thermal stability of Superhard coatings. (8)
- (ii) Discuss the thermal stability of nc-TiN/a-Si₃N₄ Superhard-coating. (8)
- OR
- 13b (i) Explain the mechanism of Nanoparticles formation by vapor phase synthesis routs. (8)
- (ii) Explain the sol-gel method to synthesis Nanoparticles (8)
- 14a (i) Explain the solid-liquid-solid growth mechanism for CNT growth. (8)
- (ii) What is functionalization of CNT? What are the different types of functionalization (8)
- OR
- 14b (i) Explain Vopour-liquid -Solid growth mechanism for nanowire. Explain with an example (16)

- 15a (i) Explain Gleiter's Classification of nanostructured materials (16)**
- OR**
- 15b (i) Discuss the different effects that control the properties of nanostructured materials (8)**
- (ii) Describes the phases of liquid crystals (8)**