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**Third Semester B.E. Degree Examination, Dec.2015/Jan.2016**  
**Foundations of Nanoscale Science and Technology**

Time: 3 hrs.

Max. Marks:100

**Note:** Answer any FIVE full questions, selecting atleast TWO questions from each part.

**PART - A**

- 1
  - a. Define the terms nano science and nano technology. Give a brief note on history of nano technology. (06 Marks)
  - b. Explain atomic structure, molecules and phases. Mention their types. (08 Marks)
  - c. Explain how surface – to – volume ratio increases as size reduces. Give the structure – property relationship. (06 Marks)
- 2
  - a. Explain the two approaches of nano materials & synthesis. (05 Marks)
  - b. What are i) Mesoporous materials ii) Semi conductors iii) Quantum dots iv) CNT and v) Nano sheets? (05 Marks)
  - c. How nano structures are classified? Explain with electron confinement and examples. (10 Marks)
- 3
  - a. Explain the mechanical and electrical properties of nano materials. (10 Marks)
  - b. Write a note on magnetic properties of nano materials. (10 Marks)
- 4
  - a. Explain dispersion behaviours of nano particles. (05 Marks)
  - b. Define the terms and explain briefly : i) Particle size ii) Shape density iii) Melting point iv) Surface tension and v) Wettability. (10 Marks)
  - c. Write a note on aggregation behaviour of nano particles. (05 Marks)

**PART - B**

- 5
  - a. Write a note on quantum size effect. (10 Marks)
  - b. What are nano scale magnets? Explain about transparent magnetic materials. (06 Marks)
  - c. What is Photo conductivity? Explain with examples. (04 Marks)
- 6
  - a. Explain the instantaneous nano foaming method for the fabrication of closed porosity silica particles. (10 Marks)
  - b. Explain about the fabrication techniques of organic nano materials. (10 Marks)
- 7
  - a. What is Bio – imaging? Explain bio imaging with quantum dots. (10 Marks)
  - b. Explain design of nano particles for oral drug delivery of peptide drugs. (10 Marks)
- 8
  - a. Write a short note on Piezo electric material with example. (05 Marks)
  - b. What are shape memory alloys? Explain about their properties. (05 Marks)
  - c. Define the following terms : Ferro fluids, Smart gel , ER fluids , MR fluids and thermo responsive materials. (05 Marks)
  - d. Write a short note on the following biomimetic effects :  
 i) Lotus effect and ii) Mussels strength. (05 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and or equations written eg. 42 x 8 = 50, will be treated as malpractice.