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10MT831

**Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024**  
**Nanotechnology**

Time: 3 hrs.

Max. Marks:100

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

**PART – A**

- 1 a. Define Nanotechnology. What are the important historical landmarks in this area? (10 Marks)
- b. How can nanotechnology be used for sustainable development? (10 Marks)
- 2 a. Explain the working principle of a scanning electron microscope. Schematically explain how an electron beam is produced in a SEM. (10 Marks)
- b. With necessary diagrams, explain Scanning Tunneling Microscopy (STM). (10 Marks)
- 3 a. What are fullerenes? With a schematic diagram briefly explain the synthesis and purification of fullerenes. (10 Marks)
- b. What are carbon-nanotubes? Explain their physical and mechanical properties. (10 Marks)
- 4 a. What are self assembled monolayers? Why gold is a preferred substrate? Explain the preparation of monolayers on gold. (10 Marks)
- b. Define atomic or molecular clusters. List various cluster sources. Explain cluster formation using laser vaporization. (10 Marks)

**PART – B**

- 5 a. What are quantum dots? List the ideal properties of nanocrystal. Explain the electronic structure of nanocrystal with necessary diagrams. (10 Marks)
- b. Elaborate on applications of semi conductor nanocrystals. (10 Marks)
- 6 a. With a neat schematic diagram explain Brust method of preparing monolayer protected clusters. (05 Marks)
- b. What are the applications of gold nanoparticles? (05 Marks)
- c. Explain the different types of core-shell systems. (10 Marks)
- 7 a. Write a note on magnetic nanoparticles. List the application of magnetic nanoparticles. (05 Marks)
- b. Briefly explain targeted drug delivery using nanoparticles. (05 Marks)
- c. Define nanosensors schematically explain self-assembly. (05 Marks)
- d. What are the materials used in diagnostic and therapeutic application? (05 Marks)
- 8 a. Write short notes on molecular motors and machines. (05 Marks)
- b. Write short notes on molecular ratchet. (05 Marks)
- c. With neat diagram, explain the nanotribometer. (05 Marks)
- d. Write short notes on nanolubrication. (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+8 = 50, will be treated as malpractice.