

**B TECH**  
**(SEM IV) THEORY EXAMINATION 2018-19**  
**NANO SCIENCE**

**Time: 3 Hours****Total Marks: 70****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A**

- 1. Attempt all questions in brief. 2 x 7 = 14**
- a. What do you mean by nanoscience and nanotechnology? Give some applications of nanotechnology.
  - b. What are Fermi surfaces?
  - c. Define lithographic and non-lithographic techniques.
  - d. What do you mean by confinement of charge carriers in different nanostructures?
  - e. Differentiate between microscopy and spectroscopy.
  - f. What do you mean by a molecular machine?
  - g. Define luminescence.

**SECTION B**

- 2. Attempt any three of the following: 7 x 3 = 21**
- a. Obtain the reflection and transmission coefficient for the case of a potential step.
  - b. Sketch the circuit diagram of single electron transistor. Explain its working in detail.
  - c. Explain the vapor-liquid-solid (VLS) method of synthesis of nanowires.
  - d. Describe transmission electron microscope (TEM). What are the differences between SEM and TEM.
  - e. Explain the term nanorobot and mention its applications.

**SECTION C**

- 3. Attempt any one part of the following: 7 x 1 = 7**
- (a) What are faces centered cubic nano particles? Explain their structure and properties.
  - (b) What do you mean by localized particles? How they are useful?
- 4. Attempt any one part of the following: 7 x 1 = 7**
- (a) Write notes on
    - (i) Coulombic explosion
    - (ii) Molecular clusters
  - (b) How does size and dimensions affect the properties of nanomaterials? Discuss in detail.
- 5. Attempt any one part of the following: 7 x 1 = 7**
- (a) Explain pulsed laser deposition and deposition of the ablation material on the substrate.
  - (b) What do you mean by evaporation technique for the growth of nanoparticles? Explain e-beam evaporation.
- 6. Attempt any one part of the following: 7 x 1 = 7**
- (a) Describe the principle and working of atomic force microscope (AFM).
  - (b) Discuss infrared spectroscopy in detail and mention its applications.
- 7. Attempt any one part of the following: 7 x 1 = 7**
- (a) What is fullerene? What are its properties? Explain how they are produced?
  - (b) Write notes on
    - (i) Nanodiamond
    - (ii) Boron nitride nano tubes.