

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID : 199362 /
199352

Roll No.

1	4	0	3	2	3	1	1	0	4
---	---	---	---	---	---	---	---	---	---

B.TECH

(SEM. III) THEORY EXAMINATION, 2015-16

NANO SCIENCES

[Time:3 hours]

[Maximum Marks:100]

SECTION-A

1. Attempt all parts. All parts carry equal marks. Write answer of each part in short. (10×2=20)
- What do you understand by term 'Void Space'?
 - Define crystallography.
 - What is absorption spectroscopy?
 - Give applications of nano wires.
 - Define principle of scanning electron microscope.
 - What is laser evaporation?
 - What is chromatography?

- (h) What is thermolysis in nano particles?
- (i) Define Fermi energy and density of state.
- (j) What do you mean by strokes line?

SECTION-B

Attempt any five questions from this section. (5×10=50)

2. What is an extrinsic semiconductor? Explain the effect on a semiconductor on adding donor impurity and acceptor impurity.
3. Explain importance of quantum mechanics in nano science. Derive time dependent and independent Schrodinger wave equation.
4. Explain phenomenon of single electron tunneling. Define working principle of infrared detector.
5. Describe the method for vapour-liquid-solid (VLS) for the formation of nanowires.
6. Explain lithography process for the formation of nano material. Mention its advantages over non-lithographic process.
7. Give the examples of “top-down” and “bottom-up” approaches to produce nanostructures. Discuss the various stages involved in the formation of quantum dots by electron beam lithography.

8. Define co-ordination number and packing fraction. Give examples of materials with BCC and FCC structure and show that packing fractions for such lattices are 0.68 and 0.74 respectively.
9. What do you understand by Raman effect? Why Raman spectroscopy is suitable for the characterization of nanostructured materials? Explain it with one example.

SECTION-C

Attempt any two from this section. (2×15=30)

10. (a) Discuss insulators, semi-conductors on the basis of energy band theory.
- (b) Explain donor, acceptor and deep trap energy level.
- (c) Write a short note on "Magnetic nano-particles"
11. (a) Describe the principles and working of infra-red spectrum? Describe in brief the vibrational modes of H₂O and CO₂ molecules.
- (b) Explain Carbon Nanotubes? Enlist the properties of carbon nano tubes and give its industrial applications.
- (c) Discuss the term "luminescence" and its application.

12. (a) Discuss the phenomenon by which we can find the surface structure of particles.
- (b) Give the principle and applications of Scanning Electron Microscopy.
- (c) Explain fullerene and its properties. Emphasize its fabricating technology.

—x—