



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

PAPER ID : 199324

Roll No.

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B.Tech.

(SEM. III) (ODD SEM.) THEORY
EXAMINATION, 2014-15
NANO SCIENCE

Time : 3 Hours]

[Total Marks : 100

Note: Attempt all questions and be precise in your answer.

1. Attempt any two parts of the following: $2 \times 10 = 20$
 - (a) What are nano science and nanotechnology? Discuss the current status of this technology.
 - (b) Discuss the size dependence properties of materials. Also explain face centered cubic nanoparticles.
 - (c) Describe the concept of energy band formation in crystal. Distinguish insulator, semiconductor and conductors on energy band concept.

2. Attempt any two parts of the following: $2 \times 10 = 20$
 - (a) Explain the preparation of quantum nanostructures and discuss their size and dimensionality effects.
 - (b) Derive an expression for wave function and energy of a particle confined in one dimensional potential box using Schrodinger wave equation.
 - (c) Obtain the theory of quantum mechanical tunneling of an electron through a step potential barrier.

3. Attempt any **two** parts of the following: $2 \times 10 = 20$
- (a) What are quantum dots? Discuss preparation and applications.
 - (b) What are magic numbers? Discuss the theoretical modelling of nanoparticles.
 - (c) Discuss the optical properties and photofragmentation of semiconducting nanoparticles.
4. Attempt any **two** parts of the following: $2 \times 10 = 20$
- (a) Describe the synthesis of carbon nano-fibers and multi walled carbon nanotubes.
 - (b) Describe the principle and working of Transmission Electron Microscopy.
 - (c) What do you understand by crystallography? Discuss briefly the determination of crystal structure.
5. Attempt any **two** parts of the following: $2 \times 10 = 20$
- (a) What are carbon nano tubes? Explain their fabrication and properties.
 - (b) Discuss X-ray spectroscopy for the analysis of nanomaterials.
 - (c) What is single electron transistor? Discuss its properties and applications.
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