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

Paper ID : 199408   Roll No.☐☐☐☐☐☐☐☐☐☐

B.TECH.

Theory Examination (Semester-IV) 2015-16

NANO SCIENCES

Time : 3 Hours   *Max. Marks : 100*

Section-A

Q.l. **Attempt all parts. All parts carry equal marks. Write answer of each part in short.**   **(2×10=20)**

(a)   What is Photo fragmentation?

(b)   What is Lattice? How it is formed?

(c)   Calculate Atomic Packing factor for Body centered cube.

(d)   Define Shallow center.

(e)   What are quantum dots?

(f)   Give two Applications of Nanotechnology.

(g)   What are super-fluid clusters?

(h)   Define Paschen's Law.

(i)   What is electroplating process?

(j)   Define Bragg's law

Section-B

2.   **Attempt any five parts from this section.**   **(10×5=50)**

(a)   What are magic numbers? Explain face centered cubic nanoparticles.

(b)   Describe tetrahedrally bonded semiconductor structure. What are Lattice vibrations?

(c)   Derive an expression for wave function and energy of a particle confined in one dimensional potential box using Schrodinger wave equation.

(d)   What are quantum dot lasers and superconductivity? Explain.

(e)   Describe pulse laser deposition technique for the formation of nanomaterials. What are the advantages and short comings of this method?

(f)   Discuss the basic principle and fabrication of AFM & STM.

(g)   What do you mean by infra-red spectrum? What are the applications of infra-red spectroscopy? Describe in brief the vibration modes of H_2O and CO_2 molecules.

(h)   What is the structure of carbon nanotubes? Explain the properties of carbon nanotubes.

Section-C

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

Q.3.   (a)   Differentiate between direct and indirect band gap in semiconductor materials giving some suitable examples.

(b)   Define and explain exciton.

(c)   Discuss optical properties of semiconducting nanoparticles.

Q.4. (a) Discuss rare gas clusters with examples.

(b) Explain the synthesis of single walled carbon nanotube.

(c) Describe crystallography with the help of suitable example.

Q.5. (a) Describe the principle of X-ray spectroscopy by the help of diagram.

(b) Write a short note on fullerene.

(c) Explain the principle and working of single electron transistor.