Name of the Department : Physics

Name of the course : B.Sc. Prog. _CBCS_DSE

Name of Paper : Nanomaterials and Applications

Semester : V

Unique Paper Code : 42227532

Question Paper Set number : Set C

Total Time: 3 Hour **Maximum Marks: 75**

Instructions for Candidates:

(a) Attempt any **Four** questions in **all**.
(b) **All** questions carry equal marks.
(c) Symbols have their usual meanings.

1. What are nano-dots, nano-wires and nano-wells? Briefly classify the nanomaterials on the basis of dimensions and confinement of particle. What is nanotechnology and how it can be used for the benefit of society.

2. How can we synthesize nanomaterials with the physical vapor deposition (PVD) method. What are the advantages and disadvantages of these methods? Explain any one of the PVD techniques with proper diagram.

3. Discuss some methods that are used to characterize nanomaterials for their structural, optical and surface morphological properties? Describe the principle and working of SEM with detailed diagram.

4. Discuss the mechanism of thermionic emission and hoping conductivity in nanostructures.

5. Differentiate between direct and indirect semiconductors with suitable diagrams. Explain giving reasons which one of the two semiconductors is useful in fabrication of LED and laser diodes. If the metal with work function of 4 eV is illuminated by light of wavelength 172 nm, find the maximum kinetic energy of the emitted electrons.

6. How can monochromatic lasers be generated using photo-luminescent quantum dots? What are advantages of quantum dot lasers over conventional semiconductor lasers?