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 B

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 0D, 1D and 2D n anostructures? How they differ from Bulk materials? What is the importance of these nanostructures in the field of science and technology. Discuss two examples where you see their impact in industry and in society.

2. Explain the gas phase condensation methods for the synthesis of nanomaterials with suitable diagrams. What are the advantages and disadvantages of these Methods?

3. What are X-rays and how they are produced? What is the Brags' law of diffraction? How XRD technique can be used for the characterisation of nanomaterials.

4. What are quasi particles and how they are different from real particles? Discuss two examples of quasi particles. What are Mott-Wannier and Frenkel excitons? How we define direct band and indirect band semiconductor? Explain them with detailed diagrams . Give one example of each.

5. What do you understand by coulomb blockade effect for a small island of a semiconductor quantum dot and its role in functioning of single electron transistor (SET). For a nanocapacitor of area 3x3 nm^2 with a electrode separation of 2 nm and a tunnel resistance of 100 KΩ, calculate the quantum uncertainty in energy for electrons.

6. Discuss basic principles of nanosensors with their applications. What are the advantages of nanosensors over conventional sensors. Explain in detail the application of nanomagnetic materials in data storage. How NEMS differ from MEMS?