Roll No. .....

(07/21-II)

11855

M. Sc. EXAMINATION

(For Batch 2017 & Onwards)

(Fourth Semester)

PHYSICS

PHY-404-A

Materials Science-II

Time : Three Hours *Maximum Marks :* 70

Note : There are nine questions in all. Q. No. **1** is compulsory, consisting of 5 short questions of 2 marks each. Student have to attempt *Five* questions in all, selecting *one* question from each Unit.

1. (a) Distinguish among metal, semiconductor and insulators on the basis of band structure.

   (b) Describe quantum size effect.

(c) How the particle size of a nanomaterial can be determined ?

(d) Write the advantages and disadvantages of top-down and bottom-up approaches.

(e) Give an idea of quantum well, wire and dot.

Unit I

2. Define density of states in bands. How the density of states varies with energy; and with size (dimension) of crystal.

3. Explain in detail the electron confinement in infinitely deep square quantum well.

Unit II

4. Write short notes on the following :

   (i) Increase in width of XRD peaks

   (ii) Shift in photoluminescence peaks in case of nanoparticles.

5. Discuss the synthesis, structure, properties and applications of Carbon nanotubes.

Unit III

6. Describe in detail the pulsed laser deposition technique of preparation of nanostructured materials.

7. Explain the sol-gel method of synthesis of nanomaterials. Write its merits and demerits also.

Unit IV

8. Discuss X-ray diffraction technique of characterization of nanostructured materials.

9. Explain transmission electron microscopy for the characterization of nanomaterials.