Roll No. .....

3+ A15

Y–2517

M. Phil. EXAMINATION, 2015

PHYSICS

Paper Second

(Physics of Advance Materials)

Time : Three Hours] [*Maximum Marks : 100*

Note : Answer all the *five* questions. *One* question from each Unit is compulsory. All questions carry equal marks.

Unit—I

1. (a) What are nanoporticles ? Give a working definition of nanoparticles. Explain, why the physical properties change drastically when size of material is reduced to nanodimensional ? 10

   (b) How metal nanoclusters are formed ? Discuss the geometric and electronic structures of metal nanoclusters giving some specific examples. 10

Or

   (a) What do you understand by semiconding nanoparticles ? Discuss the optical properties of semiconding nanoparticles and explain the phenomenon of photofragmentation. 10

(b) What are Carbon Nano Tubes (CNTs) and how are they formed ? Discuss the structure and *vibrational properties of* CNTs. 10

Unit—II

2. What are quantum dots and how are they prepared ? Discuss the phenomenon of single-electron tunneling through a quantum dot and the application of quantum dots in the fabrication of infrared detectors. 20

Or

Answer the following (any *two*) : 20

(i) Surface area of nanoparticles

(ii) Porous materials

(iii) MEMSs and NEMSs

Unit—III

3. What are superionic solids and how are they classified broadly into different solid electrolyte phases ? Discuss the method of preparation of the following : 20

(i) Glassy/amorphous solid electrolytes

(ii) Dry polymer electrolyte films

Or

Discuss the applications of superionic solids in the fabrication of All-solid-state electrochemical power sources viz. batteries, fuel cells, supercaps along with their working principles. 20

Unit—IV

4. What do you understand by Lyoluminescenece (LL) ? Discuss in detail LL-mechanism and explain the enhancement of LL in alkalihalides. 20

Or

Explain configuration co-ordinate model and energy band model for thermoluminescence. 20

Unit—V

5. Discuss general mechanism of photoconductivity process and explain the effect of trapping. 20

Or

Answer the following : 20

(i) Electronic transition

(ii) Heterojunction solar cells

50