19001436

M.Sc. DEGREE (C.S.S.) EXAMINATION, APRIL 2019

Fourth Semester

Faculty of Science

Branch II—Physics—A–Pure Physics—Elective—Bunch C–Material Science

PH4EC3—NANOSTRUCTURES AND CHARACTERIZATION

[Common with D—Material Science]

(2012 Admission onwards)

Time : Three Hours   Maximum Weight : 30

Part A (Short Answer Questions)

Answer any **six** *questions.*
Weight 1 *each.*

1. What are the different dimensions in the nanoscale ?

2. Explain what are excitons ?

3. Write note on carbon clusters.

4. What is meant by field emission ?

5. How does the presence of metal nanocluster affect the optical absorption of glasses ?

6. What are nanostructured multilayers ?

7. Draw the schematic diagram of an electron microscope.

8. What are stokes and antistokes lives ?

9. What is Larmor frequency ?

10. Compare ESR and NMR.

$(6 \times 1 = 6)$

Part B (Short Essay/Problems)

Answer any **four** *questions.*
Weight 2 *each.*

11. Explain quantum confinement in nanostructures.

12. What are actuator ?

Turn over

13. Properties of materials change at the nanoscale, why ?

14. Explain the failure mechanism in conventional grain sized materials.

15. Describe the different modes in which the probe tip of an STM is operated.

16. Explain the methodology of DSC.

$(4 \times 2 = 8)$

Part C (Essay Type Questions)

*Answer **all** questions.*
Weight 4 each.

17. (a) What are MEMS ? Explain the working of a MEMS device.

Or

(b) What are the different dimensions in the nanoscale ? Explain the density of states in low dimensional structures.

18. (a) Discuss the fabrication method of CNT. What are its different structures ?

Or

(b) How are multilayered nanostructures fabricated ? Explain the electrical properties and mechanism of conduction in gold clusters.

19. (a) Explain the principle and working of AFM. What are its applications ?

Or

(b) Discuss in detail, the methodology and instrumentation of DTA and TGA.

20. (a) Explain the principle and mechanism of mass spectrometer.

Or

(b) Explain the theory of ESR spectrometry.

$(4 \times 4 = 16)$