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HDV-003-1203002 Seat No. _____

M. Sc. (Sem. III) (CBCS) Examination

November / December – 2017

Physics : CT - 10

(Physics and Chemistry of Nanomaterials)

Faculty Code : 003

Subject Code : 1203002

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Attempt all questions.
(2) All questions carry equal marks.
(3) Mathematical symbols have equal meanings.

1 Answer in brief any **seven** : **14**

(a) Define nanotechnology and nanomaterials. **2**

(b) Give the diagram for technological revolution in science. **2**

(c) Sketch the energy band diagrams for conductors, semiconductors and insulators. **2**

(d) Explain in brief the dependence of surface to volume ratio on size of nanomaterials. **2**

(e) Give the names of various carbon derivatives. **2**

(f) Give the principle of working of TEM. **2**

(g) Explain in brief the Scherer's formula for crystallite size determination. **2**

(h) What is nanotribology? **2**

(i) What are Tectodendrimers? **2**

(j) What are MEMS? **2**

2 Answer any **two** of following questions : **14**

(a) Discuss in detail the materials at nanoscale and their structure and properties. **7**

(b) Write a note on Graphite and Diamond. **7**

(c) Growth and applications of carbon nanotubes. **7**

3 (a) Explain the nanoscience of zinc oxide and titanium dioxide in detail. 7

(b) Write a note on polymers, composites and biomaterials as prime materials in nanotechnology. 7

OR

3 (a) Write notes on SEM and TEM. 7

(b) Discuss in detail XRD and SAXS techniques for nanomaterials characterizations. 7

4 Answer any **two** of following questions : 14

(a) Write a note on physical properties of nanomaterials. 7

(b) Describe various optical spectroscopic techniques for characterization of nanomaterials. 7

(c) Define nanomedicines and discuss various approaches in developing nanomedicines. 7

5 Answer any **two** of following questions : 14

(a) Write a note on top down methods : (i) arc discharge and (ii) laser ablation. 7

(b) Discuss in detail chemical vapor deposition and molecular beam epitaxy for nanofabrication. 7

(c) What are sensors? Describe the nanosensors based on the quantum size effects. 7

(d) Write notes on nanoshells, nanopores, and Tectodendrimers. 7
