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MNT - 204

M.E./M.Tech., II Semester

Examination, June 2014

Nanoscale Devices

Time : Three Hours

Maximum Marks : 70

Note : i) This question paper contains total eight questions.

ii) Attempt any five questions. All questions carry equal marks.

1. a) What is the principle on which sputtering systems work? Differentiate DC and RF sputtering. What is reactive sputtering?

   b) Explain the principle and working of plasma enhanced CVD system and their advantages. 14

2. a) Briefly describe the major challenges in MOSFET for sub 15nm gate technology. Explain assembly and packaging.

   b) What are High-K dielectric materials? Explain their use in CMOS technology with examples. 14

3. a) What is molecular manipulation? How it is controlled by STM and AFM?

   b) What are nanolithography techniques? Discuss the tools used for nanolithography in detail. 14

4. a) Discuss the working principle of metal organic CVD write down the its advantages over other existing techniques.

   b) What do you understand with molecular beam epitaxy? How it is different with chemical beam epitaxy? 14

5. a) What is a Single Electron Transistor? Discuss about its working and applications.

   b) What are resonant tunneling diodes? Explain their working and principle using energy band diagram. 14

6. a) What are the major processing steps in silicon technology practices? Discuss in detail with suitable examples.

   b) What do you understand with E-beam lithography? Discuss about their applications, advantages and disadvantages. 14

7. a) Explain the synthesis process of Diamond. Describe the synthesis defects and its properties at the nanoscale.

   b) What are modulation-doped field effect transistors MODFETs? How they are different to conventional FETs? Discuss about their advantages. 14

8. Write a short note on any three of the following: 14
   a) Moors law
   b) Reactive ion etching
   c) Photo resist technologies
   d) Molecular self-assembly
   e) Quantum well synthesis process
   f) Coulomb blockade

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