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### EC-803

**B. E. (Eighth Semester) EXAMINATION, June, 2012**

(Electronics & Communication Engg. Branch)

**NANOELECTRONICS**

(EC-803)

*Time : Three Hours*

*Maximum Marks : 100*

*Minimum Pass Marks : 35*

**Note :** Attempt any five questions. All questions carry equal marks.

1. (a) Discuss the 'top down' and 'bottom up' approaches of nanotechnology. Why is nanoelectronics needed ?  
(b) Qualitatively discuss the analogy between extrinsic semiconductor and the intrinsic semiconductor with suitable examples.
2. (a) How does conduction take place in insulators and ionic crystals ? Also discuss the electron transport in semiconductors.  
(b) Discuss various conduction mechanisms in 3 D and 2 D and low dimensional systems.
3. (a) Discuss the concept of scanning tunnelling microscope and atomic force microscope.  
(b) Obtain expressions for tunnelling currents.

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4. (a) Describe the concepts of quantum wells, wires and dots.  
(b) Draw and discuss schematic structure of a metallic single electron transistor.
5. (a) What do you understand by molecular machine and nanobiometrics ?  
(b) Describe the basic structure of carbon nanotubes.
6. (a) State and explain the basic difference between the Thermionic and Schottky emission.  
(b) Show that the product of number of holes in the valence band and the number of electrons in the conduction band depends only on temperature and band gap. Also show that conductivity  $\sigma$  of an intrinsic semiconductor can be used to measure the band gap by calculating  $\ln \sigma$ .
7. (a) Why is the wave nature of matter not apparent to us in our daily observations ?  
(b) Discuss the chemical vapour deposition method to produce high purity and high performance solid materials.
8. Write short notes on any two of the following :
  - (i) Photolithography
  - (ii) Plasma arc discharge
  - (iii) Pulsed laser deposition
  - (iv) Molecular beam epitaxy