

# CBCS SCHEME



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15EC551

## Fifth Semester B.E. Degree Examination, June/July 2019 Nanoelectronics

Time: 3 hrs.

Max. Marks: 80

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Define nanotechnology. How nanostructures are classified? (05 Marks)  
b. Discuss sputtering and evaporation methods with respect to bottom up approach with a neat diagram. (08 Marks)  
c. Define isolated atom. (03 Marks)

OR

- 2 a. Discuss the process of lift-off technique with respect to top down approach of nano-fabrication. (08 Marks)  
b. With the help of neat diagram, discuss molecular beam epitaxy (MBE). (08 Marks)

### Module-2

- 3 a. Briefly describe various characterization methods for nanoscale materials. (08 Marks)  
b. Explain field ion microscopy with the help of neat diagram. (08 Marks)

OR

- 4 a. Discuss Scanning Tunneling Microscopy (STM) with the help of neat diagram. (08 Marks)  
b. Write short notes on: (i) Quantum wires (ii) Quantum dots (08 Marks)

### Module-3

- 5 a. State and explain requirements of an ideal semiconductor nanostructure. (08 Marks)  
b. Discuss strain induced quantum dots and wires. (04 Marks)  
c. Explain ballistic carrier transport. (04 Marks)

OR

- 6 a. Discuss electro statically induced dots and wires. (04 Marks)  
b. Explain interband and intraband absorption in semiconductor nanostructure. (06 Marks)  
c. With neat diagram discuss phonon Bottleneck in quantum dots. (06 Marks)

### Module-4

- 7 a. With the help of neat diagram, explain the experimental set up used to discover C<sub>60</sub> carbon clusters. (08 Marks)  
b. What are carbon nanotubes? Discuss their properties. (08 Marks)

OR

- 8 a. Discuss transport and mechanical properties with respect to carbon nanotubes. (08 Marks)  
b. Discuss the applications of carbon nanotubes. (08 Marks)

### Module-5

- 9 a. Discuss the various properties of a sensor with a block diagram. (06 Marks)  
b. Discuss nanosensors based on quantum size effects. (05 Marks)  
c. Explain single-photon sources. (05 Marks)

OR

- 10 a. Discuss injection and quantum cascade lasers. (08 Marks)  
b. Write short notes on the following: i) Nanobiosensors ii) Smart dust (08 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.