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BIELE-007

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

December, 2015

BIELE-007 : NANO-ELECTRONICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is allowed. Missing data, if any, may be suitably assumed.*

1. (a) What are the challenges of sub-100 nm MOSFETs ? 5

(b) What is Scaling ? What are the types of scaling ? Explain any one method of scaling. 5

2. (a) What is velocity saturation ? Explain its importance in MOSFET operation. 5

(b) Explain short channel effect in nano scale MOS devices. 5

3. (a) What is Lithography ? Explain different types of lithography process. 5

(b) What are the fundamental limits for MOS operation ? 5

4. (a) Explain the operation principle of FinFETs. Write its advantages and disadvantages over MOSFETs. 5

(b) What is Silicon On Insulator (SOI) technology ? Write its advantages and disadvantages over strained Si devices. 5

5. (a) What is Vertical MOSFET ? How is it different from Conventional MOSFET ? 5

(b) Explain the operation principle of Multi-gate MOSFET by drawing its energy band diagram. Derive the expression of threshold voltage and drain current. 5

6. What is quantum dots ? Solve the Schrodinger equation for an electron in free space. Show that the electron in free space satisfies the principles of quantum mechanics. 10

7. (a) What are the available heterojunction based devices ? Discuss the Si-Ge heterostructure with their energy band diagram. 5

(b) Differentiate between type I, II and III heterojunctions with respect to its energy band diagram. 5

8. (a) Explain the operation principle of CNFET and draw its characteristics. 7

(b) What are the applications of CNFET in electronic circuits ? 3

9. (a) What is Spintronics ? Explain the method of Spintronics used in SpinFET. Draw its characteristics graph. *5*

(b) How have Spintronics played a major role in the emerging areas of Nano-electronics ? Explain with examples looking at national and international status. *5*

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Hot Electron Effect

(b) Sub-threshold Swing

(c) Single Electron Device