

Nanoelectronics and Devices VTU CBCS Question Paper Set 2018

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10NT62

Sixth Semester B.E. Degree Examination, June/July 2016
Nanoelectronics and Devices

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting
at least TWO questions from each part.**

PART – A

- 1 a. State and explain Moore's law. Write a note on silicon electronics and its limitations. (10 Marks)
b. Discuss the International Technology Roadmap for semiconductors. (06 Marks)
c. Write a short note on nanocomputing. (04 Marks)
- 2 a. Derive an expression for tunneling probability for a particle tunneling through a potential Barrier. (12 Marks)
b. Explain the potential Energy profiles for material interfaces taking metal insulator and metal semiconductor junctions. (08 Marks)
- 3 a. What is coulomb Blockade? Explain the Tunnel Junction Excited by a current source. (10 Marks)
b. Write a note on Transport of spin and spintronics Devices and its applications. (10 Marks)
- 4 a. Write a short note on atomistic view of electrical resistance. (06 Marks)
b. Discuss the coherent transport and Non-coherent transport in molecular electronics devices. (10 Marks)
c. Write and explain schrodinger equation. (04 Marks)

PART – B

- 5 a. Write a brief note on Monte Carlo method. (10 Marks)
b. What is ab initio method? Write a note on multiscale modeling. (10 Marks)
- 6 a. Derive expression for dynamic characteristics of First and second order sensors. (10 Marks)
b. Write a short note on following physical effects :
i) Hall effect
ii) Barkhausen effect
iii) Doppler effect
iv) Faraday – Henry law effect (10 Marks)
- 7 a. Write a note on medically significant measurand and the functional specifications of Medical sensors. (10 Marks)
b. Write short notes on flow sensors and volume sensors. (10 Marks)
- 8 a. Write short notes on following :
i) Temperature sensors
ii) Chemical sensors. (10 Marks)
b. Explain briefly about optical and radiation sensors and gas sensor. (10 Marks)

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Nano Electronics and Devices

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Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Explain transition of silicon MOS transistor from micro to nano and future opportunities. (10 Marks)
b. Write short notes on silicon electronics and nano computing. (10 Marks)
- 2 a. Write short notes on :
i) Gate-oxide tunneling
ii) Hot electron effects in MOSFETs
iii) Double barrier tunneling
iv) Resonant tunneling diode. (12 Marks)
b. Explain the potential energy profiles for material interfaces taking metal insulator and metal semiconductor junctions. (08 Marks)
- 3 a. What is coulomb blockade? Explain the tunnel junction excited by a current source. (10 Marks)
b. Write short notes on coulomb blockade, coulomb blockade in a quantum dot circuit and single electron transistor. (10 Marks)
- 4 a. Explain in detail about molecular devices, logic switches and interface engineering. (12 Marks)
b. Derive Schrodinger equation for time dependent and time independent equation in detail. (08 Marks)

PART – B

- 5 a. Write a brief note on Monte Carlo method. (10 Marks)
b. What is ab initio method? Write a note on multiscale modeling. (10 Marks)
- 6 a. Define bio-sensor and explain in detail about different types of biosensor classified based on biological signaling. (10 Marks)
b. Explain any five physical effects involved in signal transduction briefly. (10 Marks)
- 7 a. Explain briefly about strain sensors along with half wave and full wave strain gauge configuration with proper circuit and equation. (10 Marks)
b. Explain different operating modes of sensors. (10 Marks)
- 8 a. Write short notes on following:
i) Temperature sensors
ii) Chemical sensors (10 Marks)
b. Explain briefly about optical and radiation sensors and gas sensor. (10 Marks)

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Important Note: On completing your answers, compulsorily draw diagonal erase lines on the remaining blank pages. Any remaining or unutilized space, eg. 4/2/8/20, will be treated as mappractise.