

# Nanoelectronics

## Questions for the theoretical part of the exam

1. Fundamentals of quantum mechanical state description
2. Schrödinger equation and solution of a microparticle confined to a string
3. Determination of the transmission coefficient of the tunnel effect
4. Quantum mechanical model of the H atom. Comparison with the Bohr model
5. Identical particles and quantum statistics. Pauli principle
6. Quantum mechanical model of multi-electron atoms, the periodic table
7. Band theory of crystal lattices
8. Classical and quantum physical interpretation of electrical conductivity
9. Hall effect
10. Operation of quantum wires
11. Quantum dot as an artificial atom
12. Quantum diode
13. Quantum transistors
14. Lasers and quantum lasers
15. Superconductivity and Josephson junction
16. Memristor

## Topics for the oral part of the exam (10-minute of a prepared presentation)

1. Comparison of different lithographic processes
2. Nanoelectronic applications of electron microscope and atomic force microscope
3. Compound semiconductors
4. Heterostructures
5. Operating principle of lasers and their use in nanoelectronics

6. Production of nanostructures with etching technologies
7. Quantum diodes
8. Field-controlled quantum transistors
9. Single-electron transistor
10. Fullerenes
11. Graphene
12. Nanotubes
13. Quantum dot
14. Quantum wire
15. Quantum trench