

*Please answer either in English or Finnish.*

1. Explain briefly (max. 2 pages altogether, draw schematics if needed):
  - a) Top-down vs. bottom-up in nanofabrication
  - b) EUV lithography
  - c) endofullerene
  - d) plasmonics
  - e) GMR effect
  - f) electrophoresis(each 1 p)
  
2. a) Resolution enhancement techniques in optical lithography (3 p) Optical corr  
b) How to achieve superhydrophobic surface by biomimetics (3 p)
  
3. Atomic force microscopy (AFM) (6 p)
  
4. Compare the three main carbon nanomaterials: properties and fabrication (6 p)
  
5. Atomic layer deposition (ALD) and its role in micro/nanoelectronics (6 p)
  
6. *Optional short questions directly from exercises. Answer, if you have no points from exercises, or want to improve them: 1 correct answer = 1 extra point, no need to answer them all if you already have points.*
  - a) What is mainly electrodeposition used for in the electronic industry?
  - b) Why is a four-point probe measurement better than a two-point probe?
  - c) Name three probe characterization methods. Mark main similarities and differences of these methods.
  - d) Some of the most important thin film deposition techniques in micro and nanoelectronics are MOCVD, ALD and MBE. Choose one of them and explain its main advantages.
  - e) Why is it important to develop compact models of electronic devices?(each 1 p)