You can answer either in English or Finnish. Numerical values of calculations are not needed (calculators not necessary).

1. Explain <u>briefly</u> (max. 2 pages altogether, draw schematics if needed):
   a) basics of EUV lithography
   b) focused ion beams in nanofabrication
   c) nanoimprint lithography
   d) break-junction technique in molecular electronics
   e) two examples of biomimetic nanostructures
   f) superhydrophobic surface
      (each 1 p)

2. a) CVD fabrication of carbon nanotubes. (3 p)
   b) Applications of carbon nanotubes. (3 p)

3. a) Nanoelectromechanical (NEMS) sensors using AFM cantilever. (3 p)
   b) Principle of a single electron transistor (SET). (3 p)

4. a) Growth process of atomic layer deposition (ALD). (3 p)
   b) Importance of high-k oxides in future CMOS transistors. (3 p)

5. a) Scanning tunneling microscopy (STM).   (3 p)
   b) An electron in STM tip has an energy of $E = 3,5$ eV as it tunnels through a $V = 7$ eV barrier with thickness d to conductive surface. Estimate the change in current if the sample-tip distance is increased from $d = 3$ Å to 9 Å. Numerical values are not necessary. (3 p)