AS-74.3136 Introduction to Microsystems

Exam, 23.05.2013

- **No books are allowed in the exam.**
- **Non-programmable scientific calculators are allowed.**

Please answer the questions below, in English or Finnish. The answer of each (sub-)question should be brief (3-5 sentences) if not otherwise indicated. Each question is worth 6 points. 15 points minimum to pass the exam.

1. What are microsystems? Please also give three examples of application of microsystems (1-2 sentences each).

2. What is microfabrication? Please describe three major techniques with graphical illustration.

3. What is scaling effect? Please explain the principle of scaling law.

4. Describe two designs of piezoelectric actuator with graphical illustrations (one linear actuator, one motor).

5. What is a microsensor? Please give two examples of microsensors with graphical illustrations (one mechanical, one chemical).

Question List for Exam

Please answer the questions below. The answer of each (sub-)question should be brief (3-5 sentences) if not otherwise indicated. Six questions will appear in the exam.

1. What are microsystems? Please also give three examples of application of microsystems (1-2 sentences each).
2. What is microfabrication? Please describe three major techniques with graphical illustration.
3. Please explain the difference between surface and bulk micromachining, with graphical illustrations.
4. What is scaling effect? Please explain the principle of scaling law.
5. What are the scaling laws of electrostatic forces and capillary force? Why are the scaling laws like that?
6. Explain the working principle of piezoelectricity, with graphical illustrations.
7. Describe two designs of piezoelectric actuator with graphical illustrations (one linear actuator, one motor).
8. Explain the working principle of shape memory effect, with graphical illustrations.
9. Explain the working principle of an electrostatic actuator, with graphical illustrations.
10. What is a microsensor? Please give two examples of microsensors with graphical illustrations (one mechanical, one chemical).
11. What is microfluidics? Please explain three special phenomena in microfluidics (1-2 sentences each).
12. What is microrobotics? What is the difference between micromanipulator and mobile microrobot?
13. Please give an example of micromanipulator with graphical illustration.
14. Please give an example of mobile microrobot with graphical illustration.
15. Please explain the major steps in microsystem packaging.
16. What is PoP? What is self-assembly?