UNIVERSITETET I OSLO

Det matematisk-naturvitenskapelige fakultet

Exam in:	**INF5450 — Evolusjonære algoritmer og maskinvare**
Day of exam:	**December 2, 2008**
Exam hours:	**09:00 – 12:00**
This examination paper consists of 2 pages.	
Appendices:	**None**
Permitted materials:	**None**

Make sure that your copy of this examination paper
is complete before answering.

Question 1 Evolutionary Computing

1a (weight 10%)
Draw a flow-chart for a general scheme of an evolutionary algorithm

1b (weight 25%)
Give two examples of problems that need to be evolved with permutation representation. What is specific for this representation and what is required of the evolutionary operators?

Explain one method for undertaking mutation and crossover, respectively for such a representation.

1c (weight 10%)
Make a table which shows how the chromosome is represented and whether crossover and mutation are applied for GA, GP, ES and EP, respectively.

1d (weight 10%)
Evolution can be applied both to "design problems" as well as "repetitive problems". Give one application example of each and explain what is important to achieve for the two kinds of problems (also sometimes called perspectives).

Question 2 Evolvable Hardware

2a (weight 10%)
Explain how fitness for a circuit can be computed. To what extent must physical hardware be included?

2b (weight 15%)
Explain the main steps of an $(1+\lambda)$-*evolution strategy* (ES) algorithm. Mention (you should not explain it) one example from evolvable hardware where the approach has been applied.

What are the alternatives for survivor selection in general for ES, and how are the variants specified? What is changed when self-adaptation is applied for ES?

2c (weight 10%)
Higuchi's group has implemented systems for EHW-based clock timing adjustment. Why is this of interest, and how has it been implemented?

2d (weight 10%)
Virtual Reconfigurable Circuits (VRCs) have been applied in several EHW systems. In what technology and in what way is it applied and why is it useful? List a couple of the works/applications where the approach has been applied.