

UNIVERSITY OF OSLO

Faculty of mathematics and natural sciences

Examination in INF-5450 — Evolvable Algorithms and Hardware

Day of examination: 1. December 2003

Examination hours: 14.30–17.30

This problem set consists of 2 pages.

Appendices: None

Permitted aids: None

Please make sure that your copy of the problem set is complete before you attempt to answer anything.

Problem 1 Evolutionary Algorithms

1a (weight 15 %)

Explain at block level which steps a simple genetic algorithm consists of.

1b (weight 10 %)

Given the following two individuals represented by their chromosomes:

1	0	1	1	0	0	1
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0	0	1	0	1	0	0
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Show and explain how these can be combined to two new individuals by crossover, cloning and mutation.

1c (weight 10 %)

Suppose in a population of three individuals that each has obtained a fitness of 2, 4 and 6, respectively. Show how a roulette wheel can be applied in this case to select individuals. Then, name some other methods for doing selection.

1d (weight 15 %)

What is meant by linear scaling of fitness values and why is it useful?

1e (weight 10 %)

What is meant by *elitism* and why is it useful?

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Problem 2 Evolvable Hardware (EHW)

2a (weight 10 %)

What are the main benefits of evolvable hardware compared to traditional design?
What are the main problems of this approach?

2b (weight 10 %)

Show by an example the relation between a chromosome and the components in a circuit that is to be evolved.

2c (weight 20 %)

Select an EHW project in the compendium and explain in short what it is about and what evolutionary principles that are applied.