

T-106.5450 Advanced Course on Compilers

The exam contains four questions. The maximum points for each question are listed in the beginning of the questions. Read the questions carefully. Give clear and compact answers. Remember to write the name of the course and your own personal information on each of the papers that you return.

- 1 (6p) Give short definitions for the following. (One point per question.)
 - a) What is a reducible flow graph?
 - b) What is a MFP solution?
 - c) What is successive over-relaxation?
 - d) What are unimodular transformations?
 - e) What is a privatizable variable?
 - f) What is loop-residue test?

- 2 (6p) Solve the domination relation of the following program by using iteration. List the phases of your iteration.

```
L1: a <- M[100]
    if a > 0 goto L2
    b <- -a
    if a > 0 goto L3
L2: b <- a*a
    if b < 200 goto L1
    if b < 0 goto L1
L3: c <- a + b
    if c > 0 goto L1
```

Based on the domination relation, find the natural loops ja list the basic blocks of each loop.

- 3 (6p) Considering the use of SSA for supporting analysis and transformations in LLVM, write an essay that is not longer than 50 lines.

- 4 (6p) Write an essay that is not longer than 50 lines discussing compiling for instruction-level parallelism.