Exam: Models of Computation TDA183 – DIT310

Date: April 6, 2013, 14.00 - 18.00

Permitted aids: English-Swedish or English-other language dictionary.

Teacher: Bengt Nordstrom, phone 070 600 1546, Computer Science, University of Gothenburg and Chalmers

All solutions must be explained! It is not enough to just give a program without an explanation of why it works. The examination of the course consists of three parts: homework assignments count up to 40 points, weekly exercises up to 20 points and this written exam up to 140 points (20 points for each problem). You have to have 100 points in total in order to pass the course. The points for homework assignments and weekly exercises are valid for one year after the start of the course.

Solutions to the exam will be available from the homepage of the course.

1. Prove or disprove the following statements:

   (a) The function `f : N -> N` which is undefined for all arguments is computable.

   (b) All closed expressions in lambda-calculus have a unique normal form.

   (c) If an open expression in lambda-calculus has a normal form, then this normal form is open.

   (d) The set of total functions `N -> Bool` is enumerable.

   (e) The set of total functions `Bool -> N` is enumerable.

   (f) If we fully evaluate a program in **X** which has a weak head normal form then the evaluation terminates.

2. Define a program `Y` in **X** such that the application `Y f` computes to the same value as the application `f (Y f)` for all functions `f`. (Don't forget to explain why!)

Good Luck!
   Bengt