Exam: Models of Computation TDA183 – DIT310

Date: Jan 13, 2016, 8:30 – 12:30, maskinsalar

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

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All solutions must be explained! 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.

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

1. Prove or disprove the following statements:
   (a) There is a function `f : Bool -> Bool` in Haskell (or some other programming language) with the property that `f x = True` if x terminates and `f x = False` if x does not terminate.
   (b) There is a program `f` in lambda-calculus which has a normal form under one computation strategy and has no normal form under another strategy.
   (c) The set of functions `N -> N` is enumerable.
   (d) If we fully evaluate a program in **X** which has a weak head normal form then the evaluation terminates.
2. What does it mean that a function `f : N -> N` is Turing-computable?
3. Explain how to use a fixpoint operator to define a recursive function!
4. Give an example of a computable function (not using Ackermann's function) which cannot be expressed in **PRF**. Explain why!

Good Luck!

Bengt