Semantics and Verification 2005 — Exam Questions

During the preparation time (20 minutes) you will be asked to solve one star exercise (see the tutorials) and briefly (in less than 5 minutes) present its solution in the beginning of your presentation (another 20 minutes). The list of exam questions for the oral exam follows.

1. Transition systems and CCS.
   E.g.: *Reactive systems and their modelling; process algebra CCS (syntax, semantics, SOS rules).*

2. Strong and weak bisimilarity, bisimulation games.
   E.g.: *Behavioral equivalences; congruence; definition of strong and weak bisimilarity; game characterization; properties of strong and weak bisimilarity.*

3. Hennessy-Milner logic and bisimulation.
   E.g.: *Model checking; syntax and semantics (operational and denotational); negation; relationship with strong bisimilarity; limitations of the logic.*

4. Tarski's fixed-point theorem and Hennessy-Milner logic with one recursive formulae.
   E.g.: *Partially ordered sets; complete lattices; Tarski's theorem; computing fixed points on finite lattices; Hennessy-Milner logic with one recursively defined variable (syntax and semantics); game characterization; examples of recursive properties.*

5. Alternating bit protocol and its modelling and verification using CWB. *(Possible pensum dispensation, check the web-page whether you are on the list!)*
   E.g.: *Description of the protocol; its formal modelling using CWB; verification questions (equivalence checking and model checking).*

6. Timed automata, networks of timed automata and their semantics.
   E.g.: *Timed transition systems; syntax and semantics of timed automata; timed/untimed bisimilarity; region graph techniques; networks of timed automata.*

7. Gossiping girls problem and its modelling and verification using UPPAAL. *(Possible pensum dispensation, check the web-page whether you are on the list!)*
   E.g.: *UPPAAL timed automata; additional features with regard to standard timed automata (constants, arrays, templates, committed/urgent locations, broadcasting, ...); modelling of gossiping girls problem; properties expressible in UPPAAL.*

8. Binary decision diagrams and their use in verification.
   E.g.: *Boolean functions and expressions; normal forms; ROBDDs; canonicity lemma; algorithms on ROBDDs; applications of ROBDDs.*