UNIVERSITÄT DES SAARLANDES

FR 6.2 – Informatik
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Lecture "Automated Reasoning II"
(Winter Term 2012/13)

Final Examination

Name: ....

Student Number: ....

Some notes:

- Things to do at the beginning:

  Put your student card and identity card (or passport) on the table.
  Switch off mobile phones.
  Whenever you use a new sheet of paper (including scratch paper), first
  write your name and student number on it.

- Things to do at the end:

  Mark every problem that you have solved in the table below.
  Stay at your seat and wait until a supervisor staples and takes your
  examination text.
  Note: Sheets that are accidentally taken out of the lecture room are
  invalid.

Sign here: **Good luck!**

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Problem	1	2	3	4	Σ
Answered?					
Points					

Problem 1 *(Congruence Closure)* (6 points)

Decide satisfiability of the below ground equations by congruence closure.

$$f(g(a), a) \approx h(b, b), f(g(b), c) \approx h(a, a), f(g(a), f(g(b), c)) \not\approx g(a),$$
$$h(a, a) \approx a, g(a) \approx h(b, b)$$

Problem 2 *(Virtual Substitution)* (6 points)

Eliminate the variable x in the below formula by the virtual substitution method. Recall that there is a choice between considering the positive or negative limit.

$$\exists x \, [y < x \, \wedge \, (x \le 3 \vee 2x = 7) \, \wedge \, (x = 1 \vee 2y < x)]$$

Problem 3 *(CDCL(LA))* (6 points)

Decide satisfiability of the below clauses by CDCL(LA).

$$x = 5 \lor y > 5$$
$$3x + y < 7 \lor y < -1$$
$$y > 0 \lor x + y > 4$$

Problem 4 *(Nelson-Oppen)* (6 points)

Check satisfiability of the below formula, a combination of EUF and LA, by the Nelson-Oppen combination method.

$$g(x) \geq z \ \wedge \ g(g(x)) < y \ \wedge \ g(x) \approx x \ \wedge \ z - y \approx 0$$