Prof. Dr. Rüdiger Ehlers Francisco Palau, M.Sc.

Applied Computational Engines 2018 – Assignment Sheet 2

Due: Monday, 23rd April 2018, 8:30am

Please indicate your **name** and **email address**. You can work in **groups** of up to **three** students. Only one submission per group is necessary. However, in the tutorials every group member must be able to present the solutions to each problem solved by your group.

Please submit your solutions either

- by e-mail to `fpalau@uni-bremen.de` **and** `rehlers@uni-bremen.de`, or
- on paper in **letter box 52** (Francisco Palau-Romero) on floor 6 of the MZH building.

Note that you will need 50% of the points on all exercise sheets in order to take the "Fachgespräch" OR the oral exam. We may ask you to present your solutions in the tutorial, especially if you work in a group. We aim for asking everyone taking part in the course to present at least twice during the course of the semester.

Exercise 1: Circuit Equivalence (30 pts.)

Are the two circuits in Figure 1 equivalent? Construct a DIMACS compatible input file as SAT instance to check this and give a list of the meanings of the SAT instance variables. Apply a SAT solver to solve the instance. If it has a solution, give the SAT solver's output along with its interpretation.

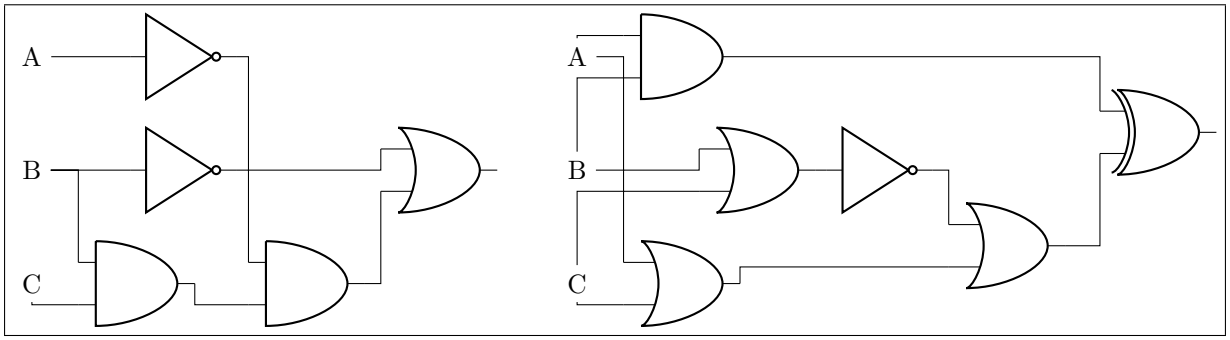

Figure 1: Two combinational circuits. NOT AND OR XOR.

Exercise 2: DPLL without unit propagation (20 pts.)

In the example for Algorithm 1 in the lecture, we fixed a variable ordering for the choices that the algorithm makes. Can you construct a small SAT instance that is solved quickly by Algorithm 1 for one ordering, but takes much longer for another ordering?

You can either use the number of conflicts or the number of nodes in the trees that depict the runs of Algorithm 1 as measure for the running time of the algorithm. In any case, justify your answer.