General Computer Science II (320201) Spring 2006

Michael Kohlhase
Jacobs University Bremen
For Course Purposes Only

April 8, 2013

Contents

Assignment 1: Resolution Calculus
(Given Feb. 13.)

Problem 1.1: Prove in the resolution calculus using derived rules:

$$\models A \wedge (B \vee C) \Rightarrow A \wedge B \vee A \wedge C$$

Solution: Clause Normal Form transformation

$$\cfrac{\cfrac{\cfrac{A \wedge (B \vee C) \Rightarrow A \wedge B \vee A \wedge C^{\mathsf{F}}}{A \wedge (B \vee C)^{\mathsf{T}}; A \wedge B \vee A \wedge C^{\mathsf{F}}}}{A^{\mathsf{T}}; B^{\mathsf{T}} \vee C^{\mathsf{T}}; A \wedge B^{\mathsf{F}}; A \wedge C^{\mathsf{F}}}}{A^{\mathsf{T}}; B^{\mathsf{T}} \vee C^{\mathsf{T}}; A^{\mathsf{F}} \vee B^{\mathsf{F}}; A^{\mathsf{F}} \vee C^{\mathsf{F}}}$$

Resolution Proof

1	A^{T}	initial
2	$B^{\mathsf{T}} \vee C^{\mathsf{T}}$	initial
3	$A^{\mathsf{F}} \vee B^{\mathsf{F}}$	initial
4	$A^{\mathsf{F}} \vee C^{\mathsf{F}}$	initial
5	B^{F}	with 1 and 3
6	C^{F}	with 1 and 4
7	C^{T}	with 2 and 5
8	$\Box$	with 6 and 7

Assignment 2: Combinatorial Circuit and its Graph
(Given Feb. 20.)

12pt

Problem 2.2 (Combinational Circuit for Logical Equivalence)
Logical equivalence can be expressed by the Boolean function

$$f\colon \{0,1\}^2 \to \{0,1\}; \langle i_1, i_2 \rangle \mapsto (\overline{i_1} + i_2) * (i_1 + \overline{i_2})$$

Draw the corresponding combinational circuit and write down its labeled graph $G = \langle V, E, f_g \rangle$ in explicit math notation.

Assignment 3: Positional Number Systems

(Given Feb. 27.)

12pt

Problem 3.3: Write down the last 4 digits of your matriculation number and (considering it as decimal number) represent it as binary, octal, and hexadecimal number.

Assignment 5: Virtual Machine
(Given March. 20.)

12pt

Problem 5.4 (Even Odd Test)
Assume the data stack initialized with `con` n for some natural number n. Write a $\mathcal{L}$(`VM`) program that returns on top of the stack 0 if n is even and 1 otherwise. Furthermore, draw the evolution of the stack during the execution of your program for $n = 4$ and $n = 5$.

Assignment 7: Search in Finite State Space
(Given April. 24.)

Problem 7.5: Does a finite state space always lead to a finite search tree? How about a finite space state that is a tree? Justify your answers.