

Logic Synthesis & Verification, Fall 2011

National Taiwan University

Problem Set 4

Due on 2011/11/30 before lecture

1 [Smallest Cube Containing]

Prove or disprove the following statements.

- (a) $\text{SCC}(c_1 + c_2) = \text{SCC}(c_1) + \text{SCC}(c_2)$, for any cubes c_1 and c_2 .
- (b) $\text{SCC}(c_1 \cdot c_2) = \text{SCC}(c_1) \cdot \text{SCC}(c_2)$, for any cubes c_1 and c_2 .
- (c) $\text{SCC}(\neg c_1 \cdot \neg c_2) = \text{SCC}(\neg c_1) \cdot \text{SCC}(\neg c_2)$, for any cubes c_1 and c_2 .
- (d) $\text{SCC}(c \cdot f) = c \cdot \text{SCC}(f)$, for any function f and cube c .
- (e) $\text{SCC}(c \cdot f_c) = c \cdot \text{SCC}(f_c)$, for any function f and cube c .
- (f) $\text{SCC}(f_1 + f_2) = \text{SCC}(\text{SCC}(f_1) + \text{SCC}(f_2))$, for any functions f_1 and f_2 .
- (g) $\text{SCC}(f_1 + f_2) = \text{SCC}(\text{SCC}(f_1) + \text{SCC}(f_2))$, for any functions f_1 and f_2 .

2 [ESPRESSO - REDUCE]

Let

$$\begin{aligned} F &= a'b'e + a'b'c' + a'bc + be' + abc' + abe + ab'c, \\ D &= a'bc'e' + bce', \\ R &= a'b'ce' + a'bc'e + ab'c', \end{aligned}$$

be the covers of the incompletely specified function (f, d, r) , don't care function d , and offset function r , respectively. Apply REDUCE based on theunate recursive paradigm as in the lecture notes on the cubes of f in order (from left to right). Show intermediate steps.

3 [ESPRESSO - EXPAND]

Apply EXPAND (using the procedure in the lecture notes) on the reduced cover derived above by REDUCE. Show intermediate steps.

4 [ESPRESSO - IRREDUNDANT]

- (a) Explain why the function $\neg g(y)$ in IRREDUNDANT can be obtained by summing over the cases of $\begin{bmatrix} F_{c_i} \\ D_{c_i} \end{bmatrix}$, for all cubles c_i of cover F .
- (b) Apply IRREDUNDANT (using the procedure in the lecture notes) on the cover derived above by EXPAND. Show intermediate steps.