Logic Synthesis & Verification, Fall 2010

National Taiwan University

Problem Set 4

Due on 2010/12/1 before lecture

1 [Smallest Cube Containing]

Prove or disprove the following statements.

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

2 [ESPRESSO - REDUCE]

Let

$$F = a'b'e + a'b'c' + a'bc + be' + abc' + abe + ab'c,$$
$$D = a'bc'e' + bce',$$
$$R = a'b'ce' + a'bc'e + ab'c',$$

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 the unate 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.