EE219B: Homework 6

Professor Robert K. Brayton

Due March 7 (Thursday)*

1. (a) Find the minimum literal factored form for the expression:

$$f = jl + hbd + bah + eh + jk + bhc.$$

   (b) How do you know that your answer is minimum?

2. Prove that for an incompletely specified function (F, D), x must appear in every factored form of (F, D) if and only if $F_x \not\subseteq F_{\overline{x}} + D_{\overline{x}}$ or $F_{\overline{x}} \not\subseteq F_x + D_x$.

3. Let (F, D) be an incompletely specified function. Let g be an optimum factored form of (F_x, D_x). Prove that if $F_{\overline{x}} = 0$ and $F_x \not\subseteq D_{\overline{x}}$, then xg is an optimum factored form of (F, D).

4. Let $f = ad + a'bc$ be a completely specified function. Let $g = a + bc$.

   (a) Use the second algorithm for Boolean division (slide 14) to compute $f \div g$ and the remainder. You may use ESPRESSO to do minimization. Show all the steps, especially in Minimum_Literal(). Use the minimum literal support version of the algorithm.

   (b) What happens when an algebraic division is performed?

5. Given expressions f and g, prove that h and r gener ated by weak division are unique.

6. Use the *Kerneling Algorithm* to find all the kernels and corresponding co-kernels for the following expressions. Indicate the level of each kernel.

$$f_1 = ab'cd + a'bcd + ab'c'd' + a'bc'd' + abc'd + a'b'c'd + abcd' + a'b'cd'$$
$$f_2 = cd'e + c'de + abfgh + a'bfgh$$

7. Prove the Fundamental Theorem of kernel-intersections, i.e. ,

   Theorem 1 *If two expressions f and g have the property that any k_f in $\mathcal{K}(f)$ and any $k_g \in \mathcal{K}(g)$, implies that $|k_g \cap k_f| \leq 1$ (k_g and k_f have at most one term in common), then f and g have no common algebraic divisors with more than one term.*

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