COE 561, Term 081

Digital System Design and Synthesis

HW# 2

Due date: Tuesday, Dec. 16

Q.1. Consider the function $F(A,B,C,D)$ with the following ON-set and DC-set:

$$F^{ON} = \sum m(5, 7, 8, 10, 12, 14, 15)$$
$$F^{DC} = \sum m(0, 1, 4)$$

(i) Compute the off-set using the recursive complementation procedure outlined in section 7.3.4

(ii) Apply the EXPAND procedure on the given cover using Espresso heuristics and show the obtained expanded cover. Compare your solution with the result obtained by ESPRESSO tool. Note that if there are minterms of the same weight, expand the minterm with the least number first (i.e. expand minterm 8 before 10). Similarly if raising all literals has the same benefit, expand the literals according to their order (i.e. literal A before B).

(iii) Apply the IRREDUNDANT procedure on the expanded cover using Espresso heuristics and show the obtained irredundant cover. Compare your solution with the result obtained by ESPRESSO tool.

(iv) Determine if any of the obtained prime implicants is an essential prime implicant or not using the method outlined in section 7.4.4. If it is essential, remove it from the cover and make the on-sets covered by it don't cares.

(v) Apply the REDUCE procedure on the irredundant cover using Espresso heuristics and show the obtained reduced cover. Compare your solution with the result obtained by ESPRESSO tool.

(vi) Apply the EXPAND procedure again on the obtained reduced cover using Espresso heuristics and show the obtained expanded cover. Compare your solution with the result obtained by ESPRESSO tool.

Q.2. Consider the following cover of a function $F(A,B,C,D)$

$$F = \overline{A}\,\overline{C} + AD + \overline{C}D + \overline{A}B\overline{D} + ABC + BC\overline{D}$$

(i) Determine the relatively essential set of cubes, E^r.

(ii) Determine the totally redundant, R^t, and partially redundant, R^p, sets of cubes.

(iii) Find a subset of R^p that, together with E^r, covers the function by solving a covering problem.

(iv) Compare your solution with the result obtained by ESPRESSO tool.