

COE 561, Term 051

Digital System Design and Synthesis

HW# 2

Due date: Wednesday, Oct. 12

- Q.1.** Consider the function $f=(a\oplus b)c$.
- (i) Compute $\partial f/\partial a$, $C_a(f)$ and $S_a(f)$.
 - (ii) Compute an expansion on the orthonormal basis $\{\varnothing_1=a, \varnothing_2=a'b, \varnothing_3=a'b'\}$.
 - (iii) Compute an expansion on the orthonormal basis $\{\varnothing_1=a+b, \varnothing_2=a'b'\}$.
 - (iv) Draw the ROBDD for the function $f=(a\oplus b)c$ using the variable order $\{a, b, c\}$.
 - (v) Draw the ROBDD for the function $f=(a\oplus b)c$ using the variable order $\{a, c, b\}$.

- Q.2.** Consider the two function functions $f=(a\oplus b)c$ and $g=abc + a'b'c'$.

- (i) Compute the following functions: $f \cdot g$, $f + g$, and $f \oplus g$.
- (ii) Draw the ITE DAGs for the following functions: $f \cdot g$, $f + g$, and $f \oplus g$.

- Q.3.** Consider the following given matrix representing a covering problem:

$$A = \begin{bmatrix} 11010100 \\ 01010000 \\ 10000100 \\ 00010111 \\ 00000101 \\ 01100000 \\ 10001000 \end{bmatrix}$$

- (i) Find a minimum cover using EXACT_COVER procedure. Show the details of the algorithm.
- (ii) Formulate the problem as a satisfiability problem. Discuss how you can solve this problem to find all possible minimum assignments.