

Homework Assignment 1

(Due 2:10pm, Sep. 16, email to daehyun.kim@wsu.edu or submit a hardcopy)

1. (10 points) Simplify the following Boolean expression as much as you can.

$$Y = \bar{A} \cdot \bar{B} \cdot \bar{C} \cdot \bar{D} + A \cdot B \cdot \bar{C} \cdot D + \bar{A} \cdot \bar{B} \cdot C \cdot \bar{D} + A \cdot B \cdot C \cdot \bar{D} + A \cdot \bar{B} \cdot C \cdot \bar{D} + \bar{A} \cdot B \cdot C \cdot \bar{D} \\ + A \cdot \bar{B} \cdot \bar{C} \cdot \bar{D} + A \cdot B \cdot C \cdot D + A \cdot B \cdot \bar{C} \cdot \bar{D}$$

2. (10 points) Draw a truth table for the following function.

$$Y = A \oplus B \oplus (C \cdot D)$$

3. (20 points) Prove the following equality.

$$A \cdot (B + C \cdot (A \oplus B \oplus D \oplus E)) = A \cdot B + A \cdot C \cdot D \cdot E + A \cdot C \cdot \bar{D} \cdot \bar{E}$$

Assume all the registers are 8-bit wide.

4. (40 points) The following shows the values of some registers.

R0: 0x48

R1: 0xF0

R2: 0x73

Answer the following questions. Show the values of R3, R4, R5, and R6 after the following instructions are executed.

ADD R3, R0, R1

AND R4, R1, R2

ORR R5, R0, R2

EOR R6, R3, R4

5. (20 points) $R0 = a_7 a_6 \dots a_0$, $R1 = b_7 b_6 \dots b_0$, and $R2 = c_7 c_6 \dots c_0$. Generate R3 from R0, R1, and R2. Try to minimize the # instructions.

$$R3 = a_7 b_6 \bar{c}_5 1 \ 0 \bar{a}_2 b_1 c_0$$