

CSE222 Computer Architecture Homework Set 08

(Exercise)

1. Simplify the following Boolean expressions using Boolean algebra theorems:

$$(1) F(A,B,C) = (A \overline{B} (C + B D) + \overline{A} \overline{B}) C$$

$$(2) F(A,B,C) = A \overline{B} + A (\overline{B + C}) + B (\overline{B + C})$$

2. Express the following Boolean equations in a sum of minterms (SOP)

$$(1) F = A + \overline{B} C$$

$$(2) F = A \overline{B} + B \overline{C} + \overline{A} C$$

3. For the following Sigma notations, using K-map to simplify them, and draw the logic circuits diagram:

$$(1) F(A, B, C, D) = \sum(1, 5, 6, 7, 13)$$

$$(2) F(A, B, C, D) = \sum(0, 1, 2, 3, 4, 6, 8, 9, 10, 11, 12, 14)$$

4. Design a circuit which has 4 binary inputs and a single output. The output will be 1 only if any 2 input singles are 1 and the other 2 signals are 0

(a) Specify the function in truth table

(b) Express the function in Boolean expression in SOP form

(c) Draw the logical diagrams in:

(c1) logic gates (simplify the expression first)

(c2) 8:1 multiplexer

(c3) 4:1 multiplexer(s)

5. Write MIPS program:

(1) Define 2 integer variables **var1** and **var2**

(2) Define a **method** to generate a random integer number in range [0, 10]

(3) Call above method twice and save random numbers in **var1** and **var2**

(4) Compare **var1** with **var2**, if **var2** is greater than **var1**, swap **var1** and **var2**

(5) Display **var1** and **var2**

6. Read an integer number, save it to variable x. Use 3 methods to calculate 7x.