Class	CS47, Sec 01
Homework	II
Due Date	November 16, 2015 11:59 PM PST

Instructions

- There are 7 questions with total 10 points.
- Please create electronic document with your answer.
- There is no need to include the question itself. However, you **MUST** include question number and sub-part index if any. Example: 9(b)
- Explain your answer clearly.
- Please create a PDF document **hw2.pdf** and ***upload that in Canvas*** assignment page by the due date.
- **NO** handwritten document is accepted.
- **NO LATE SUBMISSION.**

1. Write a program in MIPS assembly that would ask user for number of Fibonaci numbers to be generated and will store it in $s0. The program will push that many number of Fibbonacci sequence into stack. Include complete program. [**2pts**]

2. Write a program which defines total m and n integer numbers in pre-defined data area 'var_a' and 'var_b' in sorted order. The number m and n are stored in a location var_m and var_n. The program implements a merge sort between set_a and set _b and result of the sort (i.e. m+n unsigned integer in ascending sorted order) is stored in another predefined area 'var_c'. Include complete program. [**3pts**]

3. Using 2's complement binary arithmetic [**1pts**]
   (a) Convert numbers a = 6_{10} and b = -3_{10} into 4-bit two's compliment binaries.

   (b) Find product of a and b using "paper and pencil" method, i.e. first calculating partial products and then performing summation of partial products. Assume that a and b are 4-bit two's compliment binaries. Show all necessary steps.

   (c) Perform (i) zero-extension and (ii) sign-extension of numbers a and b to get 8-bit binaries. You should report 4 numbers.

4. Derive truth tables for the following Boolean functions. [**1pts**]

   (a) F(x, y, z) = (xy)' + z

   (b) F(x, y, z) = (x'yz') + (xy'z)

5. Prove by Boolean algebraic manipulation that the following expressions are valid. [**1pts**]

   (a) x'y'z' + xy'z' + x'yz' + xyz' = z'

   (b) (a'+c)(a'+d')(b+c)(b+d') = a'b + cd'

6. Using K-Map technique perform the following. [**1pts**]
   (a) Simplify the following function:

   f (A, B, C, D) = ∑ m (1, 2, 3, 4, 6, 7, 9, 11, 12, 13, 14, 15)

   Show all the "prime-implicants" and "Essential prime implicants"

   (b) Find a minimum SOP expression for:

   f (w, x, y, z) = ∑ m (0, 5, 10, 15) + d(2, 7, 8, 13)

   Show all the "prime-implicants" and "Essential prime implicants"

7. Design and implement a digital circuit which will detect a 4 bit single digit numbers. Implement the circuit with NAND only logic gate. You need to show the schematic diagram for the final logic circuit along with all the steps to derive the logic equation of the implemented circuit. [**1pts**]