

CSE 140 Homework One

January 9, 2008

*Only **Problem Set Two** will be graded. Turn in only **Problem Set Two** which will be due on Jan. 23, 2008 (Wednesday) at 11:00am.*

1 Problem Set One

- textbook 1.3
- textbook 1.5(c)(d)
- textbook 1.6(c)(f)
- textbook 2.1(c)
- textbook 2.4(a)
- textbook 2.5(c)
- textbook 2.6(b)(d)
- textbook 2.7(b)
- textbook 2.8(a)(c)
- textbook 2.13(a)(c)
- textbook 2.14(a)
- textbook 2.15(a)(b)
- textbook 2.16(a)(c)

2 Problem Set Two

1 (Design Process) Fill the missing parts in the table with the following entries.

1. Multichip modules
2. Gates
3. Flip-flops
4. Modules
5. Processors
6. Microchips
7. Boolean equations
8. Capacitors
9. Instruction sets
10. Programs

LEVEL	BEHAVIORAL FORMS	STRUCTURAL COMPONENTS	PHYSICAL OBJECTS
Transistor	Differential equations, current-voltage diagrams	Transistors, resistors, ...	Analog and digital cells
Gate	, finite-state machines	, ...	, units
Register	Algorithms, flowcharts, ..., generalized FSM	Adders, comparators, registers, counters, register files, queues, datapaths	
Processor	Executable specification, ...	, controllers, memories, ASICs	Printed-circuit boards, ...

2 (Number Conversions)

(PART A) If $(1625)_9 = (x)_3$, what is x?

(PART B) What is x and y, if the following conversions hold for both formulas?

$$\begin{aligned}(104)_x &= (25)_y \\ (144)_x &= (41)_y\end{aligned}$$

3 (Booth's Multiplication)

(PART A) For this question, we define an actual operation to be an addition or subtraction of the multiplicand from the partial product. Now, given the sign of the multiplier, please figure out whether the **first** and the **last** actual operations are going to be an **addition** or **subtraction** for each of the two cases of positive (non-zero) and negative multipliers. Show your answer clearly in the following table.

	first op	last op
Positive multiplier		
Negative multiplier		

(PART B) Consider that N_1 and N_2 are two's complement numbers. During the process of multiplying them using Booth's algorithm, in which N_1 is the multiplicand and N_2 is the multiplier, the partial product will "flip to positive", either from 0 or from a negative number. Similarly, the partial product can also "flip to negative", either from 0 or from a positive number. Both of these cases depend on both the sign of N_1 and the sign of N_2 .

The following table presents four different cases and provides you for each case how many times the partial product will "flip to positive" during the execution of Booth's algorithm on that particular case. Please figure out how many times the partial product will "flip to negative" given these conditions and show your answer in the table.

	flip to positive	flip to negative
$N_1 > 0$ and $N_2 > 0$	3	
$N_1 > 0$ and $N_2 < 0$	3	
$N_1 < 0$ and $N_2 > 0$	3	
$N_1 < 0$ and $N_2 < 0$	3	