

Name _____

CSE 241 Digital Systems

February 20, 2009

Hourly Exam #1

Instructions: Write your name on the top of each sheet. Show all work in the space provided, writing your answers in the answer box at the bottom of each page. No calculators or other electronic devices allowed. 50 min closed book.

1(a) Let $x = -382$ in sign-magnitude base-10 form. Express x as a 7's-complement base-8 number, using the least number of digits necessary to express x in this way.

1(b) Find the integer part of $1011 \times 1110 \div 1.1$. All numbers here are base-3, and the answer should also be expressed base-3. *Note: parts (a) and (b) are not related.*

1(a) _____

1(b) _____

2(a) Find the signed 1's-complement of the positive binary number 101.1 using $n=4$ and $m=1$ (ie. four integer digits and one fractional digit).

2(b) Compute $1001.1_{(2)} - 101.1_{(2)}$ using signed 1's-complement arithmetic and the results of part (a). Show your work.

2(a) _____

2(b) _____

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3.
$$f(x, y, z) = x + (y + (z + (x'yz')')')$$

(a) Simplify $f(x,y,z)$ above to DNF (Disjunctive Normal Form).

(b) Rewrite the DNF from (a) as a minterm canonical form. Either the algebraic formula or the m-notation for the minterm canonical form is ok.

3(a)

3(b)

4. Consider an incomplete Boolean function $f(w,x,y,z)$ such that $f=1$ when exactly two of its four variables are 1, $f=0$ when exactly three of them are 1, and we don't care what f is otherwise.

(a) Write a formula for $f(w,x,y,z)$ in CNF (Conjunctive Normal Form).

(b) Sketch a NAND-gate realization of $f(w,x,y,z)$ assuming double-rail logic. Your sketch may include both a-form and b-form NAND gates. Put your sketch in the box.

4(a)

4(b)