# CSE 20 Discussion

Week 2

Questions courtesy to CSE 20 WI 20

1. Fill in the blanks of the definition of the recursive function *ones*, which takes a bitstring as input and gives the number of 1s in the bitstring as output. Note that the set of all bitstrings is denoted as $\{0,1\}^*$.

$ones:$ $\rightarrow$

Basis Step:

Recursive Step:

2. Base Conversion Practice

(a) Please fill out the following table below for fixed width representations:

| base 10 (width 2) | base 16 (width 1) | base 2 (width 4) |
|---|---|---|
| $(10)_{10,2}$ | | |
| $(11)_{10,2}$ | | |
| $(12)_{10,2}$ | | |
| $(13)_{10,2}$ | | |
| $(14)_{10,2}$ | | |
| $(15)_{10,2}$ | | |

(b) Find the base 2 expansions of the following:

i. $(1337)_8$

ii. $(A96B1)_{16}$

(c) Find the base 8 expansion of $(110101011110)_2$

(d) Find the base 16 expansion of $(1010111000110011 10)_2$

(e) Find the base 2, fixed-width binary expansion of 0.1 with integer part width 1 and fractional part width 8.

3. When we have two positive integers $n$ and $m$, dividing $n$ by $m$ means writing $n$ as $mq + r$ where $q$ is the (integer) quotient and $r$ is the (integer) remainder, with $0 \leq r < m$. We can also write $q$ as $n$ **div** $m$ and $r$ as $n$ **mod** $m$.

   (a) Compute 11 **div** 3 and 11 **mod** 3

   (b) Compute -7 **div** 4 and -7 **mod** 4

4. For each of the numbers below, write the number in:

   - binary expansion
   - binary fixed-width 4
   - sign-magnitude width 4
   - 2's complement width 4

   or determine that it is not possible.

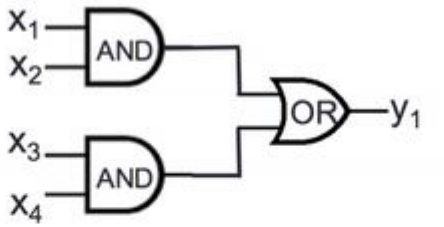
   (a) 5

   (b) -7

   (c) -8

# (Optional)

Consider the logic circuit




For which of the following settings(s) of input values is the output $y_1 = 0$? (Select all and only those that apply.)

i. $x_1 = 0$, $x_2 = 0$, $x_3 = 0$, and $x_4 = 0$

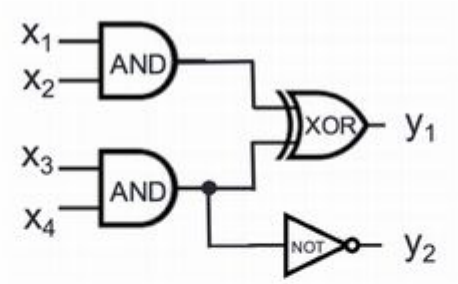
ii. $x_1 = 1$, $x_2 = 1$, $x_3 = 1$, and $x_4 = 1$

iii. $x_1 = 1$, $x_2 = 0$, $x_3 = 0$, and $x_4 = 1$

iv. $x_1 = 0$, $x_2 = 0$, $x_3 = 1$, and $x_4 = 1$

# (Optional)

Consider the logic circuit




For which of the following settings(s) of input values is the output $y_1 = 1$ and $y_2 = 1$? (Select all and only those that apply.)

i. $x_1 = 0$, $x_2 = 0$, $x_3 = 0$, and $x_4 = 0$

ii. $x_1 = 1$, $x_2 = 0$, $x_3 = 1$, and $x_4 = 1$

iii. $x_1 = 1$, $x_2 = 1$, $x_3 = 0$, and $x_4 = 0$

iv. $x_1 = 0$, $x_2 = 0$, $x_3 = 1$, and $x_4 = 1$