

CS270 Recitation 15

“Final Exam Review Session”

Goals

To help students study some of the material from early in the semester to prepare for the final exam:

1. Numerical Representation: number conversion and floating-point addition
2. Simple Circuits: transistor circuits, combinational logic, and sequential logic

Due to limitations on time and resource, we will not cover LC-3 architecture or assembly coding, or C programming.

Sample Questions

NUMERICAL REPRESENTATION

1) What is the binary equivalent of the hexadecimal number 0xF0A9?

0b1111 0000 1010 1001

2) What is the hexadecimal equivalent of the binary number 0b1101 0111 1010 0001?

0xD7A1

3) What is the decimal equivalent of the binary number 0b11001010?

202

4) What is the binary equivalent of the decimal number 292?

0b100100100

5) Translate the decimal values below into 8-bit 2's complement binary values and do the arithmetic.

12	0b00001100
+ 7	0b00000111
= 19	0b00010011

15	0b00001111
+ -4	0b11111100
= 11	0b00001011

HINT: Assume IEEE 754 single-precision format for problems 6-7, which has 1 sign bit, 8 exponent bits, biased by 127, and 23 fractional bits, with an implicit 1.

6) What are the **binary** values of the fields of the IEEE 754 single-precision format of 3.125?

Sign = 0

Exponent: $128 \text{ biased} - 127 = 1 \text{ unbiased}$

Mantissa: $1.1001 = 1.5625$

7) What is the **decimal** number represented by 0b 1 10000011 10100000000000000000000?

Sign = 1

Exponent: $131 \text{ biased} - 127 = 4 \text{ unbiased}$

Mantissa: $1.101 = 1.625$

$- 1.625 * 2^4 = -26.0$

8) Fill in the values below to add the single-precision floating point numbers $x = 2.25$ and $y = 4.50$.

$x = 2.25 = 0x40100000$, $y = 4.50 = 0x40900000$, $\text{sum} = x + y$

What is the (unbiased) exponent of x , in decimal? $128 \text{ biased} - 127 = 1 \text{ unbiased}$

What is the (unbiased) exponent of y , in decimal? $129 \text{ biased} - 127 = 2 \text{ unbiased}$

What is the mantissa of x in binary, with the implicit 1 shown? 1.001 (1.125)

What is the mantissa of y in binary, with the implicit 1 shown? 1.001 (1.125)

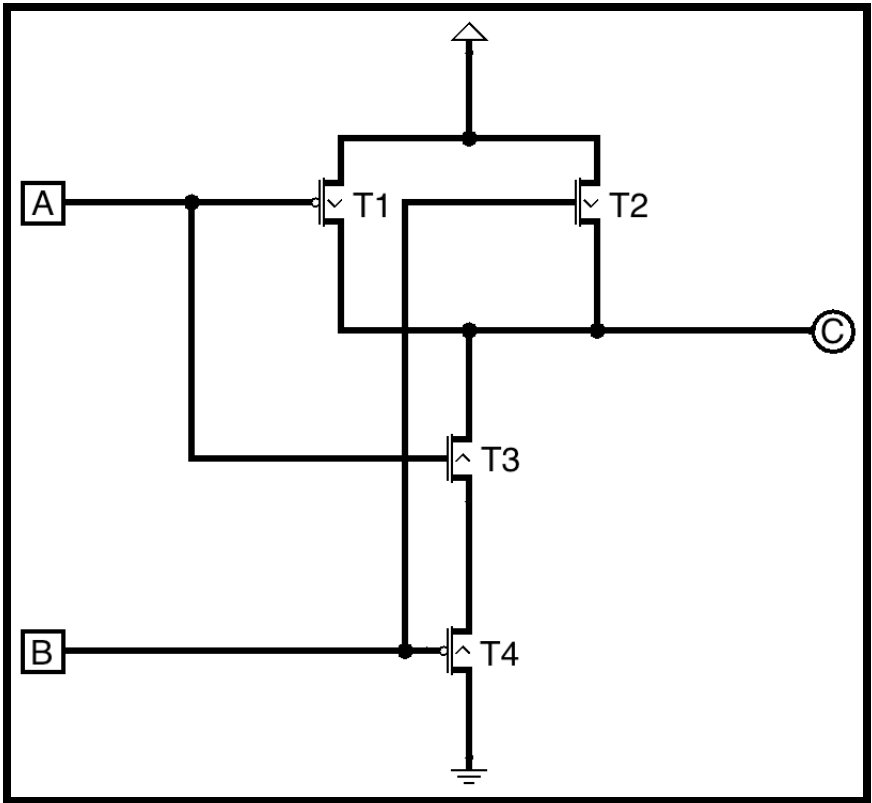
What is the mantissa of the sum after normalization? 1.1011 (1.6875)

What is the (unbiased) exponent of the sum, after normalization? $129 \text{ biased} - 127 = 2 \text{ unbiased}$

What is the hexadecimal value of the sum? $0x40d80000$

What is the decimal value of the sum? 6.75

9) Analyze the transistor circuits shown below and complete the truth table.

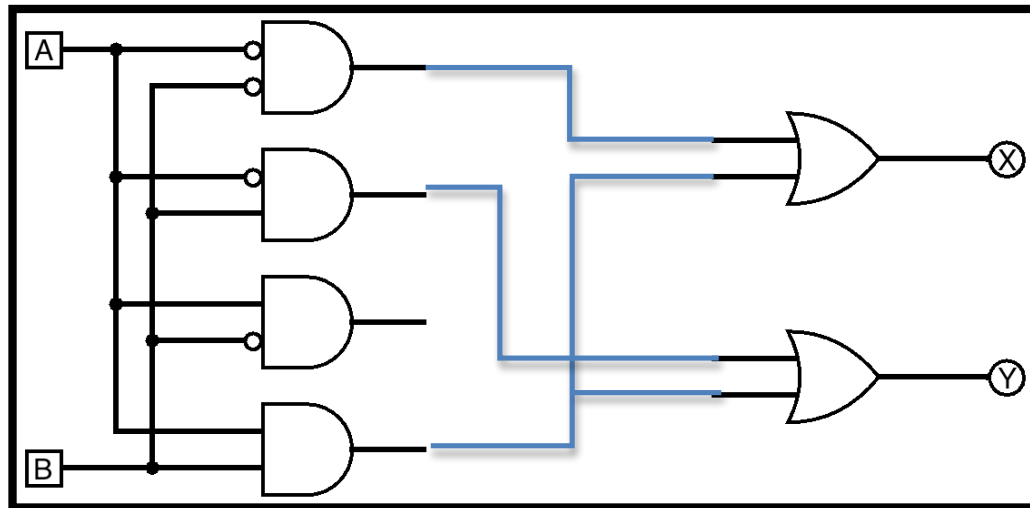


A	B	T1 (p-type)	T2 (n-type)	T3 (n-type)	T4 (p-type)	C
0	0	Closed	Open	Open	Closed	1
0	1	Closed	Closed	Open	Open	1
1	0	Open	Open	Closed	Closed	0
1	1	Open	Closed	Closed	Open	1

10) Connect the output of the appropriate AND gates to the OR gates to fulfill the truth table below.

A	B	X	Y
0	0	1	0
0	1	0	1
1	0	0	0
1	1	1	1

11)



Fill in the truth table for the D latch circuit show below.

Data (D)	Enable (EN)	Previous State	Output (Q)
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

