❖ Chapter 1: From Zero to One

Lecture Practice due Apr 1, 2023 10:37 PDT Completed

Binary to Hex

1/1 point (graded)

Express the binary number 1100001_2 as a hexadecimal number.
For example, to express 101101_2 as a hexadecimal number, you would write 2D

61 ✔

Submit Try again (1 attempt remaining) Show answer

Hex to Binary

1/1 point (graded)

Express the hexadecimal number $3AF_{16}$ as a 10-bit binary number.

1110101111 ✔

1110101111

Submit Try again (1 attempt remaining) Show answer

Hex to Decimal

1/1 point (graded)

Express the hexadecimal number BE_{16} as decimal number.

190 ✔

190

Submit Try again (1 attempt remaining) Show answer

Range of Numbers

1/1 point (graded)

What is the largest number that can be expressed with two hexadecimal digits? Express your result in decimal.

- ○ 15
- ○ 16
- ◉ 255
- ○ 256
- ○ 1023

✔

Submit Try again (1 attempt remaining) Show answer

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Bits in Byte

1/1 point (graded)

How many bits are in a byte?

8 ✔

8

Submit Try again (1 attempt remaining) Show answer

Nibbles

1/1 point (graded)

A hexadecimal digit represents ___ nibble(s) of information.

1 ✔

1

Submit Try again (1 attempt remaining) Show answer

Most Significant Byte

1/1 point (graded)

What is the most significant byte of the hexadecimal number BADB0B99

BA ✔

Submit Try again (1 attempt remaining) Show answer

Estimating Large Powers

1/1 point (graded)

Without using a calculator, estimate 2^{48}:

- ○ 16 billion
- ○ 8 trillion
- ◉ 256 trillion ✔

Submit Try again (1 attempt remaining) Show answer

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Binary Addition

1/1 point (graded)

Add the binary numbers 0010 + 0111 and express the result in binary.

1001 ✔

1001

Submit Try again (1 attempt remaining) Show answer

Overflow

1/1 point (graded)

When added to the four-bit binary number 1100, which of the following numbers will cause overflow?

- [ ] 0000
- [ ] 0011
- [x] 0100
- [x] 1111

✔

Submit Try again (1 attempt remaining) Show answer

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Sign-Magnitude

1/1 point (graded)

Express the decimal number -6_{10} as a 4-bit sign-magnitude binary number.

1110 ✔

1110

Submit Try again (1 attempt remaining) Show answer

Two's Complement

1/1 point (graded)

Express the decimal number -6_{10} as a 4-bit two's complement binary number.

1010 ✔

1010

Submit Try again (1 attempt remaining) Show answer

Subtraction

1/1 point (graded)

Compute 2 - 6 = 2 + (-6) using 4-bit two's complement numbers. Express your answer in binary.

1100 ✔

1100

Submit Try again (1 attempt remaining) Show answer

Range of Numbers

1/1 point (graded)

What is the value of the most negative 6-bit two's complement binary number. Express your result in decimal.

- ○ -6
- ○ -31
- ◉ -32
- ○ -63
- ○ -64

✔

Submit Try again (1 attempt remaining) Show answer

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Sign Extension

1/1 point (graded)

Extend the 4-bit two's complement number 0100 to 6 bits.

000100 ✔

000100

Submit Try again (1 attempt remaining) Show answer

Sign Extension

1/1 point (graded)

Extend the 4-bit two's complement number 1011 to 6 bits.

111011 ✔

111011

Submit Try again (1 attempt remaining) Show answer

Zero Extension

1/1 point (graded)

Extend the 4-bit unsigned number 1011 to 6 bits.

001011 ✔

001011

Submit Try again (1 attempt remaining) Show answer

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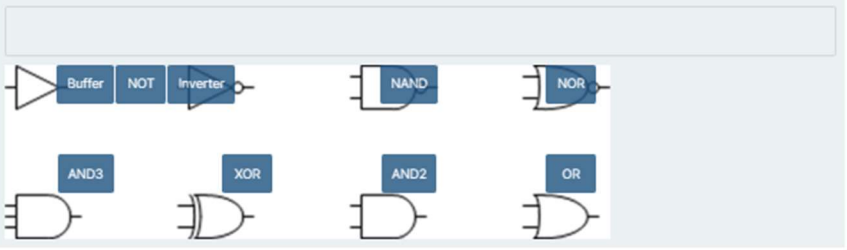
You'll need to know your logic gate symbols and truth tables by heart for the rest of this course. Take some time to review your notes or the video and commit them to memory, then try these practice problems to check your memory.

Gate Identification

1/1 point (graded)

Keyboard Help

Drag the names of gates onto their symbols.



Reset

FEEDBACK

Good work! You know your gates.

00

1/1 point (graded)

Check the boxes for all of the gates below that produce a TRUE output when both inputs are FALSE.

- [ ] AND
- [ ] OR
- [ ] XOR
- [x] NAND
- [x] NOR

Submit Try again (1 attempt remaining) Show answer

01

1/1 point (graded)

Check the boxes for all of the gates below that produce a TRUE output when one input is TRUE and the other is FALSE.

- [ ] AND
- [x] OR
- [x] XOR
- [x] NAND
- [ ] NOR

Submit Try again (1 attempt remaining) Show answer

11

1/1 point (graded)

Check the boxes for all of the gates below that produce a TRUE output when both inputs are TRUE.

- [x] AND
- [x] OR
- [ ] XOR
- [ ] NAND
- [ ] NOR

✔

Submit Try again (1 attempt remaining) Show answer

Truth Table

1/1 point (graded)

We can write a truth table in shorthand by just writing the ouput column in binary, organized with the first row in the least significant bit and the last row in the most significant bit. In this shorthand, a 2-input AND could be described as 1000, a 2-input OR as 1110, and a 3-input NOR as 00000001. Using this shorthand, give the truth table for a 2-input XOR.

0110 ✔

0110

Submit Try again (1 attempt remaining) Show answer

OR Gate

1/1 point (graded)

How many 1s are in the output column of a 3-input OR gate?

7 ✔

7

Submit Try again (1 attempt remaining) Show answer

Rows of Truth Table

1/1 point (graded)

How many (nonheading) rows are in the truth table of a 5-input gate? Hint: a 3-input gate has 8 rows.

32 ✔

32

Submit Try again (1 attempt remaining) Show answer

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Consider the following logic families

Logic Family	V_{DD}	V_{IL}	V_{IH}	V_{OL}	V_{OH}
TTL	5 (4.75 - 5.25)	0.8	2.0	0.4	2.4
CMOS	5 (4.5 - 6)	1.35	3.15	0.33	3.84
LVTTL	3.3 (3 - 3.6)	0.8	2.0	0.4	2.4
LVCMOS	3.3 (3 - 3.6)	0.9	1.8	0.36	2.7

Noise Margin

1/1 point (graded)

What is the worst-case noise margin for TTL logic?

0.4 ✔

0.4

Submit Try again (1 attempt remaining) Show answer

Compatibility

1/1 point (graded)

Select all of the following statements that are true.

- [x] A TTL gate output cannot reliably drive a CMOS input because a high output might not be a legal input.
- [ ] A CMOS gate output cannot reliably drive a TTL input because a low output might not be a legal input.
- [ ] A CMOS gate might be damaged if given a power supply voltage of 5.7 V.
- [ ] None of the above.

✔

Submit Try again (1 attempt remaining) Show answer

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Transistor as Switch

1/1 point (graded)

An nMOS transistor can be viewed as a switch that turns ON when the gate is:

- ○ 0
- ◉ 1

✔

Submit Try again (1 attempt remaining) Show answer

Transistor as Switch

1/1 point (graded)

A pMOS transistor can be viewed as a switch that turns ON when the gate is:

- ◉ 0
- ○ 1

✔

Submit Try again (1 attempt remaining) Show answer

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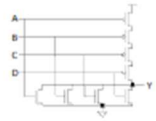
Consider the following transistor-level circuit:



Circuit Identification

1/1 point (graded)

This circuit is a:

- ○ 3-input NAND
- ○ 4-input NAND
- ◉ 4-input NOR
- ○ 8-input NOR

✔

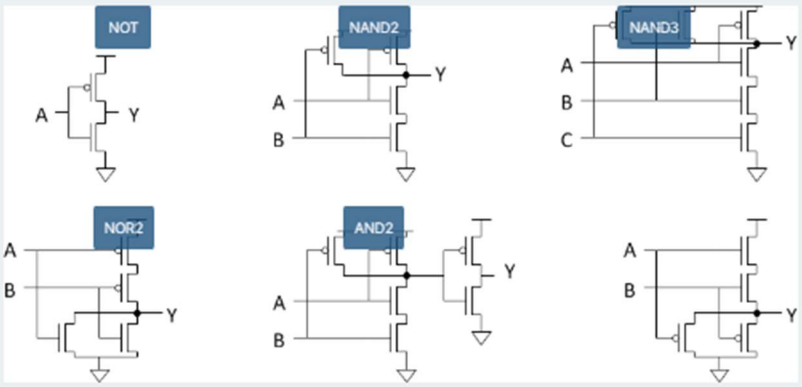
Submit Try again (1 attempt remaining) Show answer

Gate Identification

1/1 point (graded)

Keyboard Help

Drag the names of gates onto their transistor-level schematics.



Reset

FEEDBACK

ℹ Good work! You know your gates.

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Dynamic Power

1/1 point (graded)

A NOT gate has 3 fF of input capacitance and operates at a 0.9 V power supply. The system operates at 2 GHz and the input to the NOT gate has an activity factor of 0.1. The leakage current is 10 nA. Give an expression for the dynamic power consumption.

- ○ $(0.1)(3 \times 10^{-12})(0.9)^2(2 \times 10^9)$
- ◉ $(0.1)(3 \times 10^{-15})(0.9)^2(2 \times 10^9)$
- ○ $(0.9)(10 \times 10^{-9})$
- ○ $(0.9)(10 \times 10^{-12})$

✔

Submit Try again (1 attempt remaining) Show answer

Static Power

1/1 point (graded)

A NOT gate has 3 fF of input capacitance and operates at a 0.9 V power supply. The system operates at 2 GHz and the input to the NOT gate has an activity factor of 0.1. The leakage current is 10 nA. Give an expression for the static power consumption.

- ○ $(0.1)(3 \times 10^{-12})(0.9)^2(2 \times 10^9)$
- ○ $(0.1)(3 \times 10^{-15})(0.9)^2(2 \times 10^9)$
- ◉ $(0.9)(10 \times 10^{-9})$
- ○ $(0.9)(10 \times 10^{-12})$

✔

Submit Try again (1 attempt remaining) Show answer