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CS250 Computer Architecture

2018 Spring Midterm 01

Write your answers to the following questions entirely within the box provided.

1. A decoder has 1024 outputs. How many address inputs does it have?

10

2. What device in our lab kit provides human-readable output from computation?

LED

3. When does computer hardware constructed from CMOS transistors start computing?

As soon as electrical power is provided.

4. Consider a weighted positional radix 2 representation for a set of positive integers. As the range of integers to be represented grows linearly, the number of hexadecimal digits needed to write the representations of these integers in hex notation grows at what rate?

Logarithmically

5. The integers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 form the sequence called S. Each integer in S is encoded as a weighted positional 4-bit unsigned integer. Four wires are available to transport four bits at the same time, each bit on its own wire. If the sequence S is transported by the four wires with one integer of S followed immediately by the next, how many falling edges will appear in the voltage waveform on the wire carrying the LSB?

7

6. What is the technique by which a hardware circuit is extended to accept input representations having a larger number of bits?

Replication

7. What is the moving part of a computer built of CMOS transistors?

The electron

Yes, please fill in this information again. The scanning software needs see it on each page.

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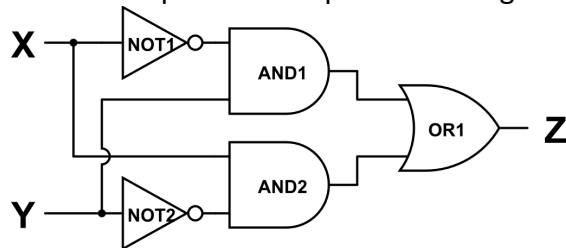
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8. Given the following truth table, which two rows show that a constant logic level input to one input will make $F(A,B) = A'$? Use two of the names of the rows that are given in the Row Name column to construct your answer.

Row Name	A	B	F(A,B)
Zero	0	0	1
One	0	1	0
Two	1	0	0
Three	1	1	0

Correct answers are Zero and Two; Zero and Three; and Zero and One (if commutativity is used to re-label inputs).

9. Using only Boolean algebra operations, draw the circuit for the equation $Z = X'Y + XY'$. Label all circuit inputs and outputs according to the equation.



10. What is the minimal SOP expression for the function $F(A,B,C)$ that is defined by the following K-map?

AB \ C	00	01	11	10
0	1	0	X	1
1	1	0	X	X

B'

11. What is the minimum number of full adders necessary to compute an integer sum with magnitude $|N|$?

$\lceil \log_2 |N| \rceil$ if unsigned integer format, $\lceil \log_2 |N| \rceil + 1$ if a signed format.