Digital Design and Computer Architecture (E85)

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Midterm

" There are 10 kinds of people in the world – those who understand binary and those who don't."

This is a closed-book closed-notes exam. You are permitted a calculator and one 8.5x11" sheet of paper with notes. You may have notes on both sides of the single 8.5x11" sheet.

You are allowed at most **50 minutes** to take the exam.

Along side each question, the number of points is written in brackets. The entire exam is worth 100 points. Plan your time accordingly. All work and answers should be written directly on this examination booklet. Use the backs of pages if necessary. Write neatly; illegible answers will be marked wrong. **Show your work** for partial credit.

Name: _____
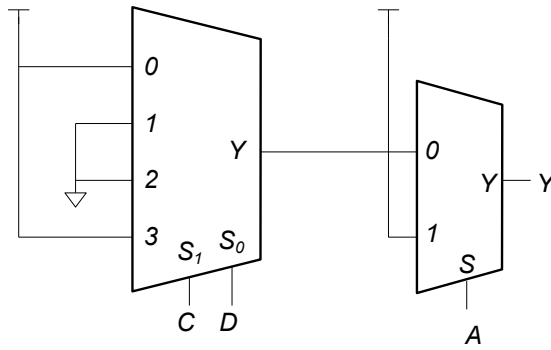
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Total: _____/100

1. [40 pts] This problem deals with Figure 1.

Figure 1.

(a) What is the function performed by the MUX configuration shown in Figure 1? Be sure to minimize the expression.

1 (cont.)

    (b) Show the gate schematic to generate Y from inputs A, C, and D. Use the minimum numbers of AND and OR gates. NOTs can be drawn as bubbles.

    (c) Show a lookup table (LUT) implementation of Y as a function of inputs A, C, and D.

2) [30pts] Perform floating point addition C= A + B in 32-bit IEEE 754 floating point format

1 bit	8 bits	23 bits
Sign	Exponent	Mantissa

where   A = 0xC29C8000

B = 0x42160000

Write the answer C in hexadecimal format.

C=_____

3.[30] You are tasked with designing an eye controller for a cat robot. The cat brain will provide a signal telling your state machine to begin a blink. A blink consists of closing the eyes for one cycle followed by opening them again. A second input that indicates if the cat is sleeping. While sleeping the eyes should remain closed. When the cat is not sleeping nor blinking the eyes should remain open. Thus your inputs and outputs are as follows:

Signal	0	1
Blink(input)	Don't blink	Blink
Sleep(input)	Don't close eyes	Close eyes
Eyes(output)	Eyes closed	Eyes open

Design a Moore FSM that generates the output sequence (eyes) from the input signals (blink, and sleep).

(a) Show state transition diagram.

4. (cont.)

    (b) Show a gate schematic for the FSM design.