

Name (Last, First) \_\_\_\_\_ Student ID number \_\_\_\_\_

UNIVERSITY OF CALIFORNIA  
College of Engineering  
Electrical Engineering and Computer Sciences Department

**EECS 145M: Microcomputer Interfacing Laboratory**

Spring Midterm #1 (Closed book- equation sheet provided- calculators OK)

Full credit can only be given if you show your work.

Wednesday, February 24, 2010

**PROBLEM 1** (24 points) Briefly describe *all* the inputs and outputs of the following circuit components and how their outputs depend on their inputs.

**1.1** (6 points) Edge-triggered flip-flop.

**1.2** (6 points) Transparent latch

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**1.3** (6 points) Tri-state buffer

**1.4** (6 points) Set-reset latch

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**PROBLEM 2** (40 points)

You need to design an interfacing circuit to read eight 8-bit digital devices using a single microcomputer and a single I/O digital port with 16 digital input lines and 16 digital output lines.

- the digital port can read or write once per microsecond
- each digital device has an input trigger, a data available output, and eight output data bits
- the input trigger line needs a high-low-high pulse with a width of at least 100 ns
- the digital devices take an unpredictable amount of time to produce their digital output
- when a digital device has asserted valid output on its eight output lines, it puts a 100 ns high-low-high pulse on its “data available” line
- the output data are valid only when the “data available” line is low
- *Hint:* Some of the digital components listed in PROBLEM 1 may be useful

**2.1** (20 points) Sketch a diagram of your system, representing each major component as a labeled rectangle. Label all components and lines. You can show the first and eighth devices with dots between.

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**2.2** (20 points) List the steps that your computer program must do to trigger digital device #1, read valid data into program memory, and then repeat with digital device #8.

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**PROBLEM 3** (36 points)

Based on what you learned in Laboratory Exercises 2 and 3, how would you use electronic components, a computer with a digital I/O port and microsecond clock, and statistical analysis to determine whether racecar drivers or jet fighter pilots have the faster reaction time? List all the steps that you need to accomplish to make a valid determination.