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.
Monday, March 3, 2003

PROBLEM 1 (20 points)
Describe the characteristics of the following circuits

1a (10 points) The transparent latch

1b (10 points) The tri-state buffer

PROBLEM 2 (25 points)

2a (10 points) Sketch the successive approximation analog to digital conversion circuit. Label each component and data line. (For example, a D/A would be drawn as a single labeled box with labeled I/O lines.) Use part 2b below to describe any complex operations.

2b Describe the operation of the successive approximation analog to digital converter. You may use words or a flow chart, provided that you describe its operation clearly.

PROBLEM 3 (25 points)

How would you use electronic components, a computer with a digital I/O port, 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.

PROBLEM 4 (30 points)
Design a system for simultaneously digitizing (within a few ns) two different analog waveforms exactly once per second using two 12-bit A/D converters that are read with a *single* 16-bit digital input port. Assume:

- Your computer program determines when the two waveforms are digitized, waits for completion, and then stores each value.
- Your program can read a 1 kHz timer using the command "time=get_tick_count"
- You have two 12-bit A/D converters with “start conversion” and “data available” handshaking lines
- Each A/D converter is started by making its “start conversion” line HIGH (5V)
- When conversion is complete, each A/D converter makes its “data available” line HIGH
- The A/D output data are valid until “start conversion” is brought LOW which makes the A/D converter bring “data available” LOW
- The computer has a 16-bit digital output port that your program can write to using the command "put_single_value (dataout)"
- The 16-bit digital input port can be read using the command "datain = get_single_value"
- You may use any components discussed in the 145M course, but keep it simple

4a. (15 points) Draw a block diagram of your system, showing and labeling all essential components, connections, and signals.

4b. (15 points) List the steps (hardware and software) to simultaneously digitize the two analog voltages, sequentially read them into computer memory, and repeat the entire process exactly once per second.