Name (Last, First) _____ Student ID number _____

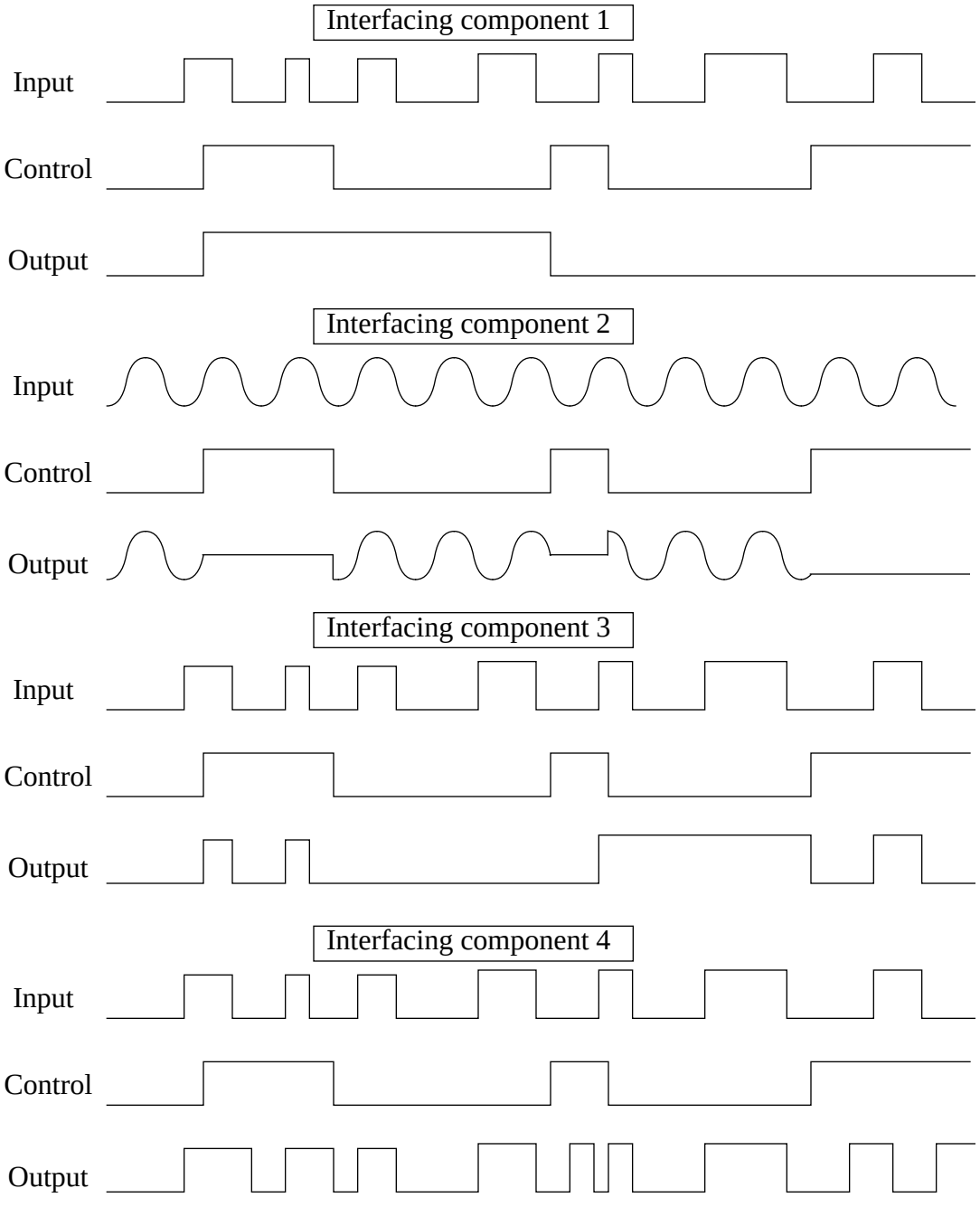
UNIVERSITY OF CALIFORNIA

College of Engineering
Electrical Engineering and Computer Sciences Department

EECS 145M: Microcomputer Interfacing Laboratory

Spring Midterm #1 (Closed book- calculators OK)
Monday, March 1, 1999

PROBLEM 1 (16 points) In this course we have discussed four interfacing components that have one input signal, one control input, and one output signal. Timing diagrams for these four components as they would occur in typical use are shown below:



Name (Last, First) _____ Student ID number _____

For each interfacing component listed below in column one, enter its number in column two:

Name	Interfacing component number
Transparent latch	
Tri-state driver	
Edge-triggered flip-flop	
Sample-and-hold amplifier	

PROBLEM 2 (27 points)

Design a microcomputer-based system for generating two different analog waveforms using two D/A converters.

Assume the following:

- The microcomputer has ***only one*** 16-bit digital output port.
- The two D/A converters have 12 bits and you need all 12 bits for good accuracy
- The D/As contain only resistors, bit switches, and an output amplifier
- Do not worry about D/A output glitches (you will address that issue in problems 3 and 4)
- You may use a number of 8-bit edge-triggered flip-flops or transparent latches, as your design requires

Do the following:

2a. (9 points) Draw a block diagram of your system, showing and labeling all essential components, connections, and signals. (Draw each D/A converter as a single box.)

2b. (9 points) In proper time sequence, list the program and hardware steps necessary for your system to rapidly convert two different numbers (n_1 and n_2) into two different voltages at the output of the D/A converters.

2c. (9 points) Draw a timing diagram for the signals described in part 2b.

Name (Last, First) _____ Student ID number _____

PROBLEM 3 (27 points)

After operating the system you designed in problem 1, you discover that occasional output glitches occur because the D/A bit switches do not charge state simultaneously. Design additional modifications to eliminate these glitches from the two analog outputs of your system.
(*Hint:* sample-and-hold amplifiers could be useful here)

3a. (9 points) Draw the modifications to your problem 1 design, showing and labeling all essential components, connections, and signals.

3b. (9 points) In proper time sequence, list the program and hardware steps necessary for your system to rapidly convert n_1 and n_2 into two glitch-free analog voltages.

3c. (9 points) Draw a timing diagram for the signals described in part 3b.

PROBLEM 4 (30 points)
Design a microcomputer-based system for generating two ***glitch-free*** analog waveforms using only ***one*** D/A converter. You may assume that the D/A is much faster than the required output data rate.
(*Hint:* sample-and-hole amplifiers are useful here also)

4a. (9 points) Draw a block diagram of your system, showing and labeling all essential components, connections, and signals.

4b. (9 points) In proper time sequence, list the additional program and hardware steps necessary for your system to rapidly convert n_1 and n_2 into two glitch-free analog voltages.

4c. (9 points) Draw a timing diagram for the signals described in part 4b.

4d. (3 points) What precaution is necessary for producing constant or slowly varying waveforms?