EE 308

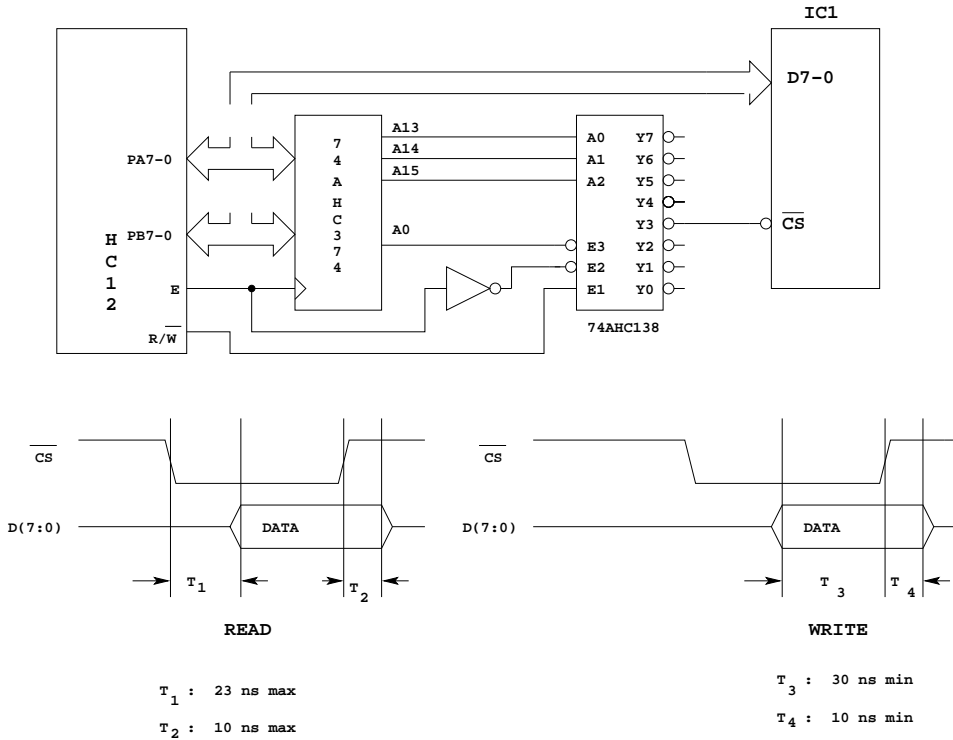**Homework 12**
Due April 17, 2006

1. An engineer drew a quick sketch of an IC interfaced to the 9S12. She accidently spilled some coffee on the sketch, and some details were lost. On the same piece of paper she drew the timing diagram for an input IC and and output IC. but forgot to label which diagram corresponds to IC1 interfaced to the 9S12. The figure below shows her sketch:

   (a) Is IC1 an input or an output port? Explain.

   (b) Should the data lines of IC1 be connected to the Port A or the Port B pins? Explain.

   (c) For what range of addresses will IC1 be selected? Explain.

   (d) If IC1 is an input port, write some C code to read a byte of data from IC1 and save it in a variable called `data`. If IC1 is an output port, write some C code to write a 0x55 to IC1.

   (e) Is the timing of IC1 compatible with an 9S12 with an 24 MHz E-clock, and no E-clock stretches? Explain. (Assume the propogation delays through each glue logic chip is 2 ns.)

   (f) Is the timing of IC1 compatible with an 9S12 with an 24 MHz E-clock, and one E-clock stretch? Explain.

2. The figure below shows a peripheral chip connected to an 9S12 using some standard CMOS logic chips. For this problem assume that the propagation delay through each CMOS logic chip is 2 ns.

IC1 Read Timing

t_{DAR} = 40 ns max t_{DHR} = 30 ns max

IC1 Write Timint

t_{DSW} = 40 ns min t_{DHW} = 10 ns min

(a) Will IC1 be an input device or an output device? Explain

(b) Should the data lines of IC1 be connected to Port A or Port B on the 9S12? Explain.

(c) For what range of addresses will IC1 be selected?

(d) Sketch the signals on the E, $R/\overline{W}$, $\overline{LSTRB}$, $\overline{CS1}$ and $D7 - 0$ lines for the following actions:
   - If IC1 is an input device, the 9S12 reads from IC1, and IC1 returns an 0x55.
   - If IC1 is an output device, the 9S12 writes an 0xAA to IC1.

   Note: Only do one of these, based on your answer to Part (a) above.

(e) Will the circuit shown work reliably with an 9S12 running with an 24 MHz E-clock, and no E-clock stretches? Explain.

(f) Will the circuit shown work reliably with an 9S12 running with an 24 MHz E-clock, and one E-clock stretch? Explain.