EE 308 – Homework 5
Due 3-30-07

For all problems below assume your are using a 68HC912B32 chip with a 16 MHz crystal (which results in an 8 MHz timer clock).

1. An analog signal has a frequency content that varies from 0 Hz to 3.5 kHz. It is to be sampled at a frequency of 5 kHz. Is this sampling rate sufficient to allow for reconstruction of the signal? Why or why not?

2. A 4 kHz signal is to be sampled with the HCS12 ATD converter system. What sampling frequency should be used? Why?

3. What register is the Sequence Complete Flag (SCF) in? How does the SCF flag get set? How do you clear it?

4. Write some code which will enable the A/D converter, put it into 8-bit mode, and convert the analog inputs on pins PAD0 through PAD7 continuously.

5. Write some code which will enable the A/D converter, put it into 10-bit mode, and convert the analog inputs on pins PAD0 through PAD7 once. Add some code which will wait until the eight conversions are completed.

6. Write some code which will enable the A/D converter, put it into 8-bit mode, and convert the analog input on pin PAD3 eight times, then stop. Add some code which will wait until the eight conversions are completed.

7. Add some code to the above problem which will average the eight values of the conversions of PAD3.

8. On an HC12, VRL is connected to 1 V, and VRH is connected to 3 V. The A/D converter is set up to do 10-bit conversions.
(a) What voltage step will cause the A/D converter to change value?
(b) If the input to the A/D converter is 2.3 V, what number will result from a conversion?
(c) If the result of a conversion is 0x17B, what was the input voltage to the A/D converter?

9. The LM35 is a sensor from National Semiconductor which puts out an analog voltage which is a linear function of the temperature. When connected properly, the sensor 0 V at a temperature of 0ºC, and a voltage of 1.5 V at +150ºC. This output is connected to an A/D input of the HCS12. The HCS12 ATD is running in 10 bit mode.
(a) What is the smallest temperature change which can be measured?
(b) What is the temperature when the A/D output is 0x009D?