CDA 4203 Sec 001 Spring 2015

Computer System Design

Instructor: Dr. Srinivas Katkoori

**Homework 4 – ADCs, DACs, and USB**

*Assigned on Wednesday, 15th April*

*DUE: 11:59PM, Friday, 24th April*

Note:

1. Recommended submission is by Canvas.
2. If you handwrite the answers, you may want to scan and upload to Canvas.
3. Regular Credit: 40 pts; Extra Credit: 20 pts.

**Your Name: Your U#:**

**ADCs and DACs**

1. (5 pts.)Briefly describe the three main steps implemented in an Analog-to-Digital Converter.
2. (10 pts.)Given an analog output signal whose voltage should range from 0 to 10V, and an 8-bit digital encoding, provide the encodings for the following desired voltages: (a) 0V, (b) 1V, (c) 5.33V, (d) 10V, what is the resolution of the conversion?
3. (10 pts.)Given an analog input signal whose voltage ranges from 0 to 5V, and an 8-bit digital encoding, calculate the correct encoding for 3.5V, and then trace the successive-approximation approach (i.e., list all the guessed encodings in the correct order) to find the correct encoding.
4. (5 pts.)Sketch the successive approximation ADC circuit and explain how it works.
5. (5 pts.) What are the main advantages/disadvantages on an R-2R DAC?
6. (5 pts.) What is Nyquist’s theorem? What problem do we encounter if we do not meet Nyquist’s sampling rate?

**(Extra credit 20 pts) USB 2.0 Protocol**

1. (5 pts.)What are the different speeds supported by USB 2.0 protocol? For each speed, (a) identify the supported data transfer rate; (b) give an example of a peripheral.
2. (5 pts.)What are different types of Tokens? For each token type, briefly explain its purpose.
3. (5 pts.)What are the four types of data transfer? Compare them in terms of polling interval, priority, and delivery guarantees.
4. (5 pts.) How is the plug-n-play feature work to identify full-speed and low-speed peripherals?