**EE 445S Real-Time Digital Signal Processing Laboratory – Prof. Brian L. Evans**

**Lab 3 Instructions – Part 1**

**1. winDSK demonstration**

Connect your DSP board with the PC through the serial cable. Run winDSK8 on the PC, and then follow the instruction on page 34-37 in the real-time DSP book to run the “Graphic Equalizer” and “Notch Filter” applications.

**2. FIR filter design**

Run fdatool in Matlab to design a bandpass FIR filter:

* Design method: Equiripple
* Order: 30
* Sampling frequency: 48000Hz
* Passpand: 5000Hz to 15000Hz (Fstop1 and Fstop2 can be 4000Hz and 16000Hz)

Export the coefficients into the workspace with variable name “Num”.

Set “C:\CD\code\appendix\_e\MatlabExports” as the current folder of Matlab.

In the command window run

>>fir\_dump2c(‘coeff’,’B’,Num,length(Num));

(If you copy and paste the above command in MATLAB, the ‘’ commas might not show up properly, giving errors. Hence, type the above command in MATLAB instead of copying and pasting.)

You will find “coeff.c” and “coeff.h” in the current folder. Open “coeff.h”, change “define B\_SIZE 31” to “define N 30”. Open “coeff.c”, change “B\_SIZE” to “N+1”. You will need these two files later.

**3. Theoretical magnitude response measurement**

Go back to fdatool. Measure the magnitude response (dB) for the FIR filter that you just designed. You need to measure the magnitude response for 1 KHz, 2 KHz … 24 KHz. Save these values in an Excel file. You will need to compare them with the experimental values later.

**4. DSK implementation using linear buffer**

Create a new project as before. After adding the files in “common code” folder, add “FIRmono\_ISR.c” and “StartUp.c” in “code\chapter\_03\ccs\FIRrevB”. Add the “coeff.h” and “coeff.c” in “code\appendix\_e\MatlabExports” that you just generated. Finally add the target configuration files as usual.

Run the program; connect the board with the signal generator and the oscilloscope. Tune the frequency in the signal generator from 1 KHz to 24 KHz and record the experimental magnitude response. Compare this with the theoretical magnitude response. (You may draw two lines in the same graph)

**5. DSK implementation using circular buffer**

Create a new project as before. After adding the files in “common code” folder, add “FIRmono\_ISR.c” and “StartUp.c” in “code\chapter\_03\ccs\FIRrevD”. Add the “coeff.h” and “coeff.c” in “code\appendix\_e\MatlabExports” that you just generated. Finally add the target configuration files as usual.

Run the program; connect the board with the signal generator and the oscilloscope. Tune the frequency in the signal generator from 1 KHz to 24 KHz and record the experimental magnitude response. Compare this with the theoretical magnitude response.

**6. Compare linear buffering and circular buffering**

Measure the number of clock cycles cost by the convolution implementation using linear buffer and circular buffer.