University of North Texas, College of Engineering
Department of Electrical Engineering

EENG 3910: Project V - Digital Signal Processing System Design

Assignment 3

Lab Session: Monday, 02/15/2016
Due: Monday, 02/22/2016

Student Name: _____

Important:

- Please create a new assignment folder in your working directory for each assignment, and a new problem folder in the assignment folder for each problem.
- Please backup your files in your own USB drive or your own network drive at the end of each class because the workbench computers may be reimaged without prior notice.

Problem 1. Sample on-board temperature sensor.

- Follow the Getting Started document "Getting_Started_CCS6.pdf" to create a new CCS project for Tiva C Series LaunchPad. You may name the new CCS project as Lab3_1.
- Delete the "main.c" file if you have generated that file automatically when you were creating your new CCS project.
- Copy the source code file "Lab3_1_main.c" into your project folder.
- Build, load, and run your project on Tiva LaunchPad.
- In this project, ADC is enabled and it is used to sample a temperature sensor that is built inside the Tiva MCU processor. So, we can measure the temperature of the processor. You may press your finger on top of the processor to see the variation of temperature value.
- Open up PuTTY terminal to connect it to Tiva LaunchPad through UART. Study the code to see how to display temperature value on the terminal window.
- Study the code carefully to understand how to program ADC device on Tiva. Explain the code and the ADC programming procedures in your report.

Problem 2. Sample on-board temperature sensor based on timer.

- Create a new CCS project with the name of Lab3_2.
- Write a program (a modified version of Lab3_1) to sample the on-board temperature sensor using Timer1 with a sampling period of 2 second, then print the value on UART terminal after sampling.
- The new program should work exactly same as project Lab3_1, except the ADC sampling is done on timer instead of upon user UART command. Timer0 is still used to blink LEDs as heartbeat indicator.
- Explain your code in your report.

Problem 3. Sample on-board temperature sensor with FPU enabled.

- Create a new CCS project with the name of Lab3_3.
- Delete "main.c" if you have generated the file automatically.
- Copy the source code "Lab3_3_main.c" into your project folder.
- Build, load, and run your project on Tiva LaunchPad.

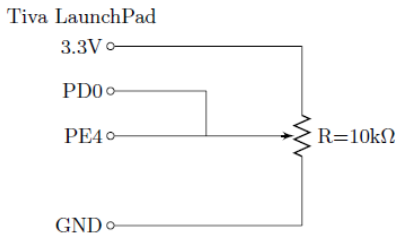
- This program is exactly same as Lab3_1, except FPU is enabled here to make it possible to use floating-point variables and calculations in your program.
- Study the code and explain the use of FPU in your report.

Problem 4. Sample on-board temperature sensor based on timer with FPU enabled.

- Create a new CCS project with the name of Lab3_4.
- Write a program (a modified version of Lab3_2) to do exactly the same thing as in Lab3_2, except that the temperature values are calculated in floating-point format as in Lab3_3.
- Explain your code in your report.

Problem 5. Voltage meter with ADC

- Create a new CCS project with the name of Lab3_5.
- Write a program to do the following:
  - Blink LEDs at the rate of 2Hz using Timer0.
  - Enable UART to accept user command and display messages.
  - Configure the pin PD0 as analog input and sample with ADC0.
  - Configure the pin PE4 as digital input.
  - Enable Timer1 to interrupt at the rate of 1Hz.
  - Sample PD0 with ADC0 and read PE4 on Timer1 interrupt. Then print both values on UART terminal.
  - Build the circuit below on breadboard and connect to Tiva LaunchPad.



  - Build and run your program.
  - Adjust potential meter and monitor the printout of PD0 and PE4 values on PuTTY terminal. Determine the threshold voltage value between logic 0 and logic 1 on the digital input pin PE4.
- Important: you need to be extra careful when interfacing circuits with Tiva LaunchPad. The GPIO pins on Tiva are 5V tolerant, but in general you should strictly limit the voltage level to 0 - 3.3V. Excessive voltage on the GPIO pins may damage the processor.

Assignment Deliverables:

- Compile your report with pictures, plots, and the codes that you have written or modified.
- Explain in detail what you have done, why you have done in that way, and what you have learnt. Follow the report format outlined in the Introduction lecture notes.
- Email your report and source codes for grading. For source code submission, you will need to zip your working directory and send the zipped file to your TA at VeenaChidurala@my.unt.edu.
- Printout of your source code should be attached to your lab report as appendix. If your source code goes beyond two pages, please only print the part of the source code where you have newly written or modified.