

Requirements Specification for EE465 Lab Project 5: Analog Temperature Sensor

Lab project goal: Measure the analog voltage output from a temperature sensor and the temperature sensor on the MSP430 and display the ambient air temperatures from both devices.

Use the 16-position keypad to enter a value 1 through 9. Display that number on the top line of the LCD. Take n readings of the voltage output of the temperature sensor and the onboard temperature sensor on the microcontroller where n is the entered value. Upon finishing each conversion, the program will calculate an average of the converted values. After averaging n results, display the ambient air temperature in degrees Kelvin and Centigrade on the top line of the LCD for the LM19 and on the second line of the LCD for the microcontroller.

Requirements for lab project completion:

- 1.** Modify your MSP430 breadboard to match the schematic developed in class titled “Lab5 – Analog Temperature Sensor.” Each lab team member must build a hardware circuit and receive a sign off for his or her own circuit.
- 2.** When the numbers 1-9 are entered via the keypad, the microcontroller will read the analog voltage output from the LM19 temperature sensor and the on-chip temperature sensor until n successive readings are obtained, where n is the number entered. The top row of the LCD should read “Enter n:” followed by the entry. After each new value for n is entered, the old number should be erased, and the new entry displayed following “Enter n:”
- 3.** Both lines of the LCD display should display the average of n readings of ambient air temperature in degrees Kelvin and Centigrade. For the LM19 use the top line, and for the on-chip sensor uses the bottom line. The temp readings should be rounded to the nearest whole number and should appear after the fixed character strings “T,K:kk” and “T,C:cc” where kk is the air temperature in K and cc is the air temperature in C. Upon pressing the “*” key the program will return to the “Enter n:” prompt.
- 4.** Add an LM19 temperature sensor to the MSP430 and use the A to D to read the analog voltage value. Data sheets for the LM19 temperature sensor are available at our class web site.

6. Your project grade will be based on the memo report that you hand in during this or subsequent lab sessions and your demonstration of your code written for this lab.

Your **Memo Report** must include:

- a. A memo report summarizing the methods you used to solve the problem. Your memo report should include a flow chart for your program.
- b. Each student should upload their commented code to the appropriate “Dropbox” for this lab on D2L.

Memo Report Date: Thursday, April 2, 2020 (by Midnight)

Code Demonstration:

- c. A sign-off from the instructor or a TA indicating that your program performed as required and the required circuit modifications were completed. **Each lab team member must build and demo a hardware circuit to receive a sign off for their own circuit.** A sign-off sheet will be kept by the instructor and TA indicating completion of the lab.

Demo Due Date: Tuesday, March 31, 2020 (by end of lab time)