

ECED 3204 Microprocessor

Assignment #8

<http://www.jasongu.org/3204/assignments.html>

Due date: No submission required.

Assignment #8 contains the following problems:

E16.1 Design a circuit that can scale the voltage from the range of 0 mV ~ 100 mV to the range of 0 V ~ 5 V.

E16.6 Suppose that there is a 12-bit A/D converter with V_{RL} and V_{RH} set to 1.5 V and 3.5 V respectively. Find the corresponding voltage values for the A/D conversion results of 80, 180, 480, 640, 960, 1600, 2048, 3200, and 4000, respectively.

E16.7 Write a sequence of AVR instructions and C statements to configure the AVR MEGA2560 ADC to operate with the following settings:

- Select differential mode input
- Select ADC1 and ADC0 as positive and negative inputs with gain set to 10
- Disable auto-triggering
- Set ADC clock prescaler to 128 assuming that the MEGA2560 uses a 16-MHz crystal oscillator to generate its system clock
- Select AVCC as its reference voltage
- Result right-justified
- Disable digital input buffers of the unused analog inputs
- Disable ADC interrupt

E16.16 The Microbridge AWM3300V is a mass airflow sensor manufactured by Honeywell. The block diagram of the AWM3300V is shown in Figure E16.16. It is designed to measure the airflow. Its applications include air-conditioning, medical ventilation/anesthesia control, gas analyzers, gas metering, fume cabinets, and process control. The AWM3300V operates on a single $10\text{ V} \pm 10\text{ mV}$ power supply. The sensor output (V_{OUT}) corresponding to the airflow rate of $0 \sim 1.0\text{ L/min}$ is 1.0 V to 5.0 V. The AWM3300V can operate in the temperature range from -25 to 85°C . It takes about 3 ms for the output voltage to settle after power up. Design a circuit to measure and display the mass airflow using the AWM3300V. Write a program to configure the MEGA2560 ADC module, start the A/D conversion, and display the mass airflow in an LCD display. Update the display every 200 ms.

