**Internet of Things**

**Lab Report 2**

**Hafiz Ahmad**

**19l-1316**

**Section-7A2**

**Introduction to Microcontroller Architecture and Programming**

**Interface**

**INTRODUCTION:**

It introduces students to the fundamentals of embedded computing with microcontrollers. Working with the PIC24 microcontroller, students create software in 16-bit assembly and embedded C. Focus will be place on interfacing devices with GPIO, PWM, timer subsystem and ADC. A microcontroller is essentially a small computer on a chip. Like any computer, it has memory, and can be programmed to do calculations, receive input, and generate output. Unlike a PC, it incorporates memory, a CPU, peripherals and I/O interfaces into a single chip.

**OBJECTIVES:**

1. To learn about Arduino Mega 2560 hardware architecture
2. To learn about programming interface for Arduino development boards

**Application:**

Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. When it comes to the Internet of Things (IoT) and smart objects, their computational ability is usually driven by microcontrollers or MCUs. These are essentially scaled-down computers that operate smart devices by providing processing power, memory, and input/output peripherals.

**Issues:**

I never face any issue regarding this lab.

**Conclusion:**

In this lab we understand about IoT, Microcontroller Architecture and Programming Interface. We also know about their applications and search on internet applications based on (Internet of Things)

**In lab:**

**Q#1 Describe the difference between Flash Memory and SRAM of microcontroller. Write down**

**the items that you use in your daily life which utilizes Flash Memory.**

flash memory is used to store data and initialize it. we execute the code but cannot modify the data in flash memory .it is a type of nonvolatile memory that erases data in units called blocks and rewrites data at the byte level. Flash memory is widely used for storage and data transfer in consumer devices, enterprise systems and industrial applications.

SRAM or Static Random Access Memory can be read and written from your executing program. but never has to be refreshed. It is not used for a computer's main memory because of its cost and size. computers use DRAM due to low in cost and greater densities.

**Q#2 What is the advantage of EEPROM? When you will use EEPROM in your**

**microcontroller?**

EEPROM type data memory is also very common in many microcontrollers. The advantage of an EEPROM is that the programmer can store nonvolatile data in such a memory and can also change this data whenever required.it is look like flash as we never change data in flash but in EEPROM we change it so that’s why it is commonly used in microontroller.it is possible to read data from it and erase it and write data to it. To erase the data, a relatively high voltage is required, and early EEPROMs needed an external high voltage source.

**Q#3 What are the disadvantages of uploading code using Arduino Bootloader? How you can**

**avoid it?**

Using bootloader, you cannot get an extra 2k of program memory space and with a dedicated programmer you have more control over the obscure things like the fuses (sort of hew option flags). If you want to use the full flash of the chip or avoid the bootloader delay, you can burn your code using an external programmer.

**Q#4 Why ADC is used for Analog pins in microcontrollers?**

ADC converters are very useful in control and monitoring applications because most sensors, pressure sensor, and force sensor produce analog output voltages which cannot be read by a microcontroller without an A/D converter. On the Arduino board, these pins have an 'A' in front of their label to indicate these pins can read analog voltages. ADCs can vary greatly between microcontrollers

**Q#5 How speed of DC motor is controlled by PWM technique?**

speed of the electric motor depends on the modulator voltage, greater the voltage, the faster the rotation of an electric motor. Pulse width modulation turns a digital signal into an analog signal by changing the timing of how long it stays on and off. duty cycle is used to describe the percentage or ratio of how long it stays on compared to when it turns off