**IOT & Automation Lab**

**Assignment -1**

**1. What is a Prototype? Discuss Open-Source and Closed-Source Prototype Platforms.**

* **Prototype:**

A prototype is an early version of a product or system created to evaluate the design, test its functionality, and identify any improvements needed. Prototypes help in refining the concept and functionality before finalizing the product for manufacturing or release.

* **Open-Source Prototype Platforms:**

Open-source platforms are available to the public, allowing users to modify and share the source code freely. These platforms encourage collaboration and community-driven improvements.

**Examples:**

* **Arduino:** Widely used for electronics and automation projects. It allows users to build interactive devices.
* **Raspberry Pi:** A small, affordable computer capable of running various operating systems, suitable for prototyping software and hardware projects.
* **Closed-Source Prototype Platforms:**

In closed-source platforms, the source code is restricted and not available to the public. Users cannot modify or distribute it without permission.

**Examples:**

* **Google Earth:** A tool for viewing geographical data, but its underlying source code is not available.
* **Microsoft Windows:** A popular closed-source operating system.
* **Mac OS:** Apple's operating system, also a closed-source product.

**2. What is Arduino?**

* **Arduino:**

Arduino is an open-source electronics platform that enables people to create electronic projects quickly and easily. It is a popular choice among hobbyists, students, and engineers for building prototypes and small-scale projects.

* **Circuit Board:** The hardware that receives input from sensors or controls output to various devices.
* **Programming Environment:** A software interface that allows users to write and upload code to the Arduino board.

**3. Arduino Uno R3 Key Specifications**

* **Main Processor:**

The Arduino Uno R3 is powered by the ATmega328P microcontroller, which is based on an 8-bit RISC (Reduced Instruction Set Computer) architecture.

* **Memory:**

**SRAM (Static Random Access Memory):** Stores temporary data while the program is running. The Arduino Uno has 2KB of SRAM.

**Flash Memory:** Stores the program code. The board has 32KB of flash memory.

**EEPROM (Electrically Erasable Programmable Read-Only Memory):** Non-volatile memory, used to store data that needs to be retained even after the Arduino is powered off. It has a 1KB capacity.

* **I/O Pins:**

The Arduino Uno has 14 digital input/output pins, 6 of which support PWM (Pulse Width Modulation) output, and 6 analog input pins for sensors.

**Assignment -2**

**1. What is an Encoding Format? Provide Examples of Encoding Formats for Different Data Types.**

* **Encoding Format:**

An encoding format is a standardized way to convert data into a format that computers can store, process, and transmit efficiently. Each type of data (text, images, audio, etc.) uses specific encoding formats optimized for that data type.

**Examples of Encoding Formats:**

* **Text Encoding:**

**ASCII:** A basic text encoding standard that uses 7-bit binary numbers to represent characters (e.g., A, B, 1, 2).

**Unicode:** A comprehensive standard that includes characters from almost all languages worldwide.

**UTF-8:** A widely-used encoding that supports both ASCII and other Unicode characters.

* **Number Encoding:**

**Binary:** Numbers are encoded using only 0s and 1s, the language of computers.

**Decimal:** The standard base-10 number system.

**Hexadecimal:** Base-16 number system, often used in computer science (0-9, A-F).

* **Image Encoding:**

**JPEG:** Lossy compression format, typically used for photographs.

**PNG:** Lossless compression format, ideal for images with text or sharp edges.

**GIF:** Supports simple animations and transparency, often used for logos and icons.

**BMP:** An uncompressed format, resulting in larger file sizes.

**TIFF:** Lossless compression format, used for high-quality images.

* **Audio Encoding:**

**MP3:** A lossy compression format, ideal for music and podcasts.

**WAV:** A lossless audio format, providing high-quality sound.

**FLAC:** Another lossless format, commonly used for high-fidelity music.

* **Video Encoding:**

**MP4:** A common video format used for streaming and storage.

**AVI:** A video container format that supports multiple codecs.

**MOV:** Apple's proprietary video format.

**WMV:** Windows Media Video, a format created by Microsoft.

**Assignment -3**

**Explain the Basic Structure of an Arduino Program**

An Arduino program consists of two main functions: setup() and loop(). These functions contain blocks of code that instruct the Arduino board on how to interact with external devices like sensors or LEDs.

* **The setup() Function**:  
  This function is run once when the Arduino is powered on or reset. It is used to initialize variables, pin modes, libraries, or any other settings required before the main execution begins.  
  For example:

void setup() {

pinMode(13, OUTPUT); // Set pin 13 as an output pin

}

* **The loop() Function**:  
  This function is executed continuously as long as the Arduino board is powered on. It contains the main logic of the program, such as reading inputs and controlling outputs.  
  For example:

void loop() {

digitalWrite(13, HIGH); // Turn on the LED

delay(1000); // Wait for one second

digitalWrite(13, LOW); // Turn off the LED

delay(1000); // Wait for one second

}