

**Assignment 1**

**Name:** Hassan Hussein Azmy

**B.No:** 7

1. **Different Microcontroller Families and Brands:**
2. **AVR**
   * **Brand:** Atmel Corporation
   * **Architecture:** 8-bit RISC, Harvard architecture
   * **Common Series:** ATmega, ATtiny, ATxmega
   * **Features:**
     + Internal, self-programmable instruction [flash memory](https://en.wikipedia.org/wiki/Flash_memory) up to 256 KB
     + On-chip debugging support through JTAG or [debugWIRE](https://en.wikipedia.org/wiki/DebugWIRE" \o "DebugWIRE)
     + Multiple power-saving sleep modes
     + Supports USB and Ethernet
     + Has SPI and I2C interfaces
3. **PIC**
   * **Brand:** microchip technology
   * **Architecture:** 8-bit, 16-bit, 32-bit RISC, Harvard architecture
   * **Common Series:** PIC10, PIC12, PIC16
   * **Features:**
     + Flash memory, SRAM and EEPROM
     + Low Cost
     + Sleep mode
     + Low power consumption
     + Watchdog timer
4. **MSP430**
   * **Brand:** Texas instrument
   * **Architecture:** 16-bit RISC, von-Neumann architecture
   * **Common Series:** MSP430G2, MSP430F5
   * **Features:**
     + Low power consumption
     + Wide range of integrated peripherals
5. **ESP32**
   * **Brand:** Espressif Systems
   * **Architecture:** 32-bit RISC
   * **Common Series:** ESP32-S2, ESP32-S3
   * **Features:**
     + Integrated Wi-Fi and Bluetooth
     + Low power consumption
     + Peripheral interfaces (I2C and SPI)
     + Security
6. **RX**
   * **Brand:** Renesas Electronics
   * **Architecture:** 32-bit CISC, Harvard architecture
   * **Common Series:** RX100, RX200, RX600
   * **Features:**
     + Excellent Power Efficiency
     + high-speed flash memory
     + Fast Interrupt Response Performance
     + Better Code Efficiency
     + Comprehensive Peripheral Functions (USB and Ethernet)
     + Hardware Safety Functions
7. **STM32**
   * **Brand:** STMicroelectronics
   * **Architecture:** 32-bit ARM Cortex-M
   * **Common Series:** STM32F0, STM32F1, STM32L4
   * **Features:**
     + Real-time performance
     + Low power consumption
     + Advanced, innovative peripherals
     + Optimized integration
8. **Cortex-M4 vs PIC16F877A:**

|  |  |  |
| --- | --- | --- |
| **Property** | **Cortex-M4** | **PIC16F877A** |
| **Architecture** | A 32-bit microcontroller with ARMv7E-M architecture | An 8-bit microcontroller with a simpler RISC architecture |
| **Memory** | Has more memory | Limited to 368 bytes of RAM and 8K words of Flash |
| **Peripherals** | Has Rich set of peripherals including  (CAN, USB) and more GPIO pins | Has essential peripherals including ADC, USART, SPI, and I2C |
| **Power efficiency** | Advanced power management features with multiple sleep modes | Low power consumption with basic power-saving modes |
| **Usage** | Designed for complex computations and real-time applications. | Designed for less computationally tasks. |

1. **References:**

* [AVR microcontrollers - Wikipedia](https://en.wikipedia.org/wiki/AVR_microcontrollers)
* [PIC microcontrollers - Wikipedia](https://en.wikipedia.org/wiki/PIC_microcontrollers#Hardware_features)
* [MSP430 Ultra-Low-Power Microcontrollers Brochure 2H 2006 (Rev. L)](https://www-bsac.eecs.berkeley.edu/~boser/courses/40/labs/docs/MSP430%20overview.pdf)
* [ESP32 - Wikipedia](https://en.wikipedia.org/wiki/ESP32)
* [RX 32-Bit MCUs Family Features | Renesas](https://www.renesas.com/en/products/microcontrollers-microprocessors/rx-32-bit-performance-efficiency-mcus/rx-features)
* [Releasing your creativity Discover the STM32 family of microcontrollers & microprocessors](https://www.st.com/resource/en/product_presentation/microcontrollers-stm32-family-overview.pdf)