



EMBEDDED SYSTEMS

ASSIGNMENT 1

كريم وائل محمد محمد صقر

BN: 24

SEC: 2

Introduction

Microcontrollers (MCUs) are integrated circuits (ICs) designed to do specific operations in embedded systems unlike general-purpose processors, which are built to run various software applications, microcontrollers are designed with specialized purposes in mind.

Microcontrollers consist of a processor (central processing unit or CPU), memory (volatile and non-volatile, to store program data), and input/output (I/O) peripherals onto a single chip.

Microcontrollers Families & Brands

The following are the most popular microcontroller families and brands:

PIC Family

- **PIC10**
 - PIC10F200
 - PIC10F202
 - PIC10F204
- **PIC12**
 - PIC12F508
 - PIC12F675
 - PIC12F1822
- **PIC16**
 - PIC16F877A
 - PIC16F84
- **PIC18**
 - PIC18F452
 - PIC18F4550
 - PIC18F2620
- **PIC24**
 - PIC24FJ64GA002
 - PIC24FJ128GA310

ARM Cortex Family

- **Cortex-M0 / M0+**
 - STM32F070 (STMicroelectronics)
- **Cortex-M4s**
 - TM4C123GH6PM (Texas Instruments)
 - STM32F407 (STMicroelectronics)
- **Cortex-M3**
 - STM32F103 (STMicroelectronics)
- **Cortex-M7**
 - STM32F746 (STMicroelectronics)
 - ATSAME70 (Microchip)

AVR Family

- ATtiny2313
- ATmega128
- ATmega32U4
- AT90S8515
- ATtiny44

Difference between TM4C123GH6PM & PIC16F877A

Comparison Point	TM4C123GH6PM	PIC16F877A
Architecture	ARM Cortex-M4 (32-bit) (Harvard architecture)	8-bit (Harvard architecture)
Manufacturer	Texas Instruments	Microchip
Instruction Set	32-bit ARM Cortex-M4 Instruction Set	8-bit Reduced Instruction Set Computing (RISC)s
Memory	Flash memory: 256 KB SRAM: 32 KB	Flash memory: 8 KB SRAM: 368 bytes
Peripherals	PWM, UART, I2C, SPI, ADC, Timers, USB, GPIO, CAN, and more.	UART, I2C, SPI, ADC, Timers, GPIO
I/O Pins	64 (43 general-purpose I/O (GPIO) pins)	40 (33 GPIO pins)
Power Modes	Multiple power modes such as Sleep, Deep Sleep, and Hibernate	Simple Sleep mode

Power Consumption	More power consumption due to its higher performance and clock speed.	Low power consumption
Operating Voltage	3.3 V	5 V
Cost	More expensive due to its higher performance	Less expensive
Applications	Advanced Robotics, Motor Control, Internet of Things (IoT)	Basic Robotics, Home Automation, Security Systems
Summary	High-performance, real-time systems	Cost-sensitive, low-power systems