**8051 Microcontroller**

**What is a Microcontroller?**

A Microcontroller is a programmable digital processor with necessary peripherals. Both microcontrollers and microprocessors are complex sequential digital circuits meant to carry out job according to the program / instructions. Sometimes analog input/output interface makes a part of microcontroller circuit of mixed mode (both analog and digital nature).

**Microcontrollers Vs Microprocessors**

1. A microprocessor requires an external memory for program/data storage. Instruction execution requires movement of data from the external memory to the microprocessor or vice versa. Usually, microprocessors have good computing power and they have higher clock speed to facilitate faster computation.
2. A microcontroller has required on-chip memory with associated peripherals. A microcontroller can be thought of a microprocessor with inbuilt peripherals.
3. A microcontroller does not require much additional interfacing ICs for operation and it functions as a stand-alone system. The operation of a microcontroller is multipurpose, just like a Swiss knife.
4. Microcontrollers are also called embedded controllers.
5. A microcontroller clock speed is limited only to a few tens of MHz. Microcontrollers are numerous and many of them are application specific.

**Internal Architecture of Microcontroller**



Note: External memory can be attached i.e. why shown with dotted lines.

1. Development of some popular microcontrollers is given as follows.
2. Intel 4004 4 bit (2300 PMOS trans, 108 kHz) 1971
3. Intel 8048 8 bit 1976 Intel 8031 8 bit (ROM-less) .
4. Intel 8051 8 bit (Mask ROM) 1980 Microchip PIC16C64 8 bit 1985 Motorola 68HC11 8 bit (on chip ADC) .
5. Intel 80C196 16 bit 1982 Atmel AT89C51 8 bit (Flash memory) .
6. Microchip PIC 16F877 8 bit (Flash memory + ADC)

**Classification of microcontroller based on Instruction set and Architecture.**

What is CISC and RISC

CISC

CISC is an acronym for Complex Instruction Set Computer. CISC allows the user to insert a single instruction as an alternative to many simple instructions.

RISC

RISC is an acronym for Reduced Instruction Set Computers. RISC helps in reducing the operational time by shortening the clock cycle per instruction.

MCs with Harvard architecture are called "RISC MCs". MCs with von Neumann's architecture are called 'CISC microcontrollers'. • The atmega328p MC has a RISC architecture.

Harvard architecture is a newer concept than von-Neumann's architecture

• In Harvard architecture, data bus and address bus are separate. Thus a greater flow of data is possible through the CPU, and of course, a greater speed of work. It is also typical for Harvard architecture to have fewer instructions than von-Neumann's, and to have instructions usually executed in one cycle. All of these instructions are executed in one cycle except for jump and branch instructions