APPLICATIONS OF REGISTERS

ELECTRICAL CIRCUITS AND SYSTEMS

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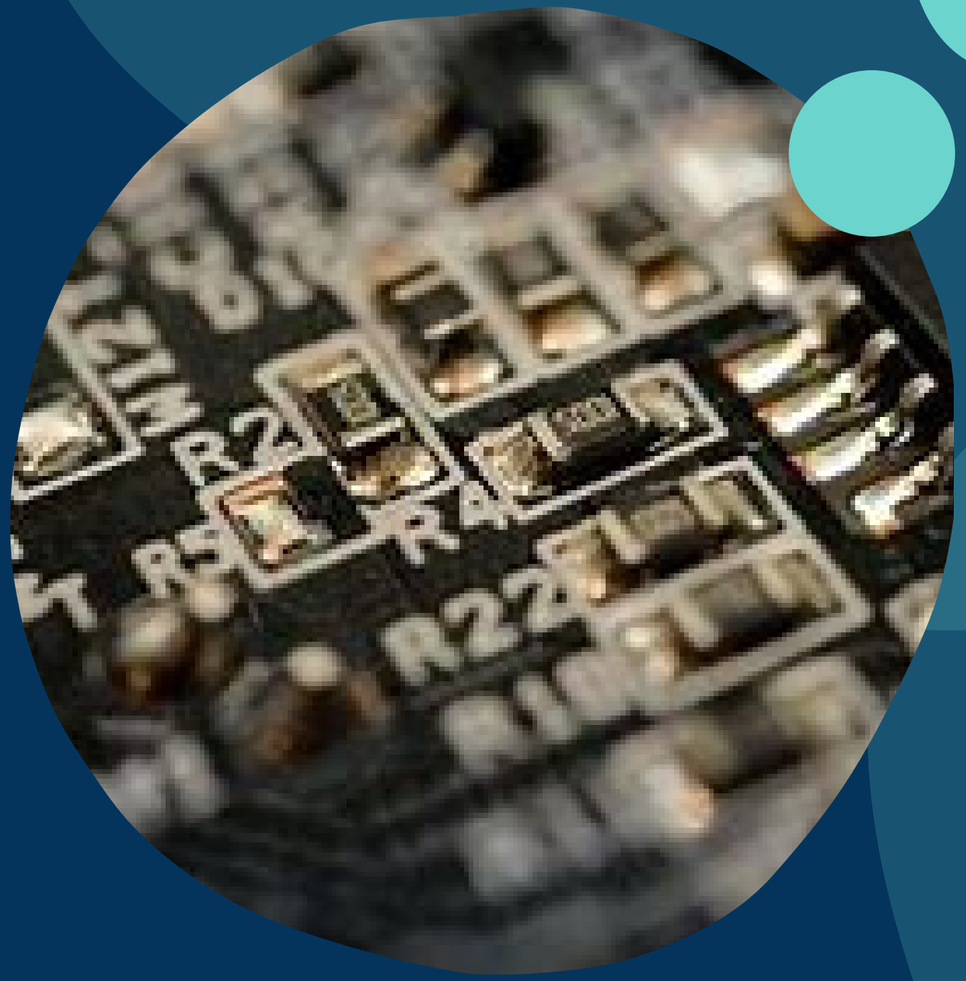
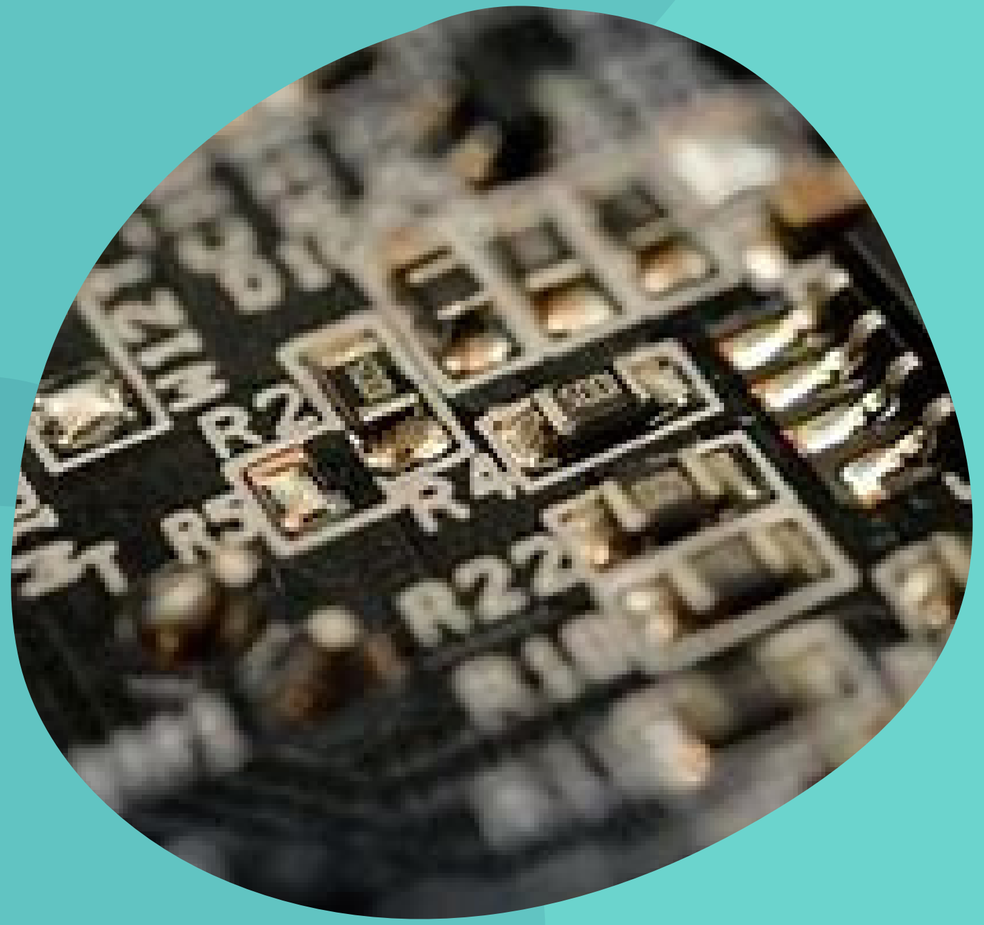
REGISTERS





REGISTERS

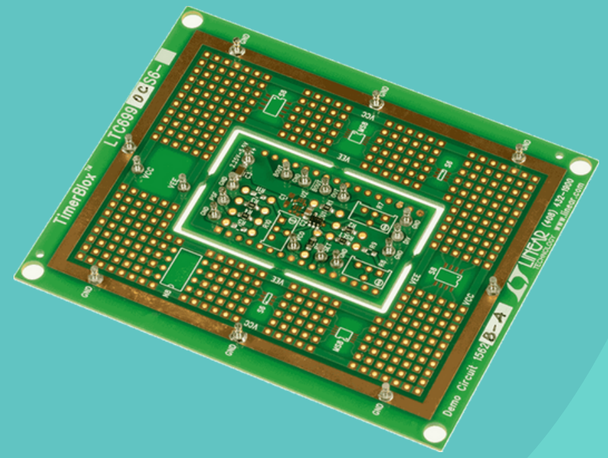
- Collection of flip flops.
- To store single bit digital data.
- These registers mainly perform operations in the CPU.
- There are the following operations which are performed by the registers.
    - Fetch
    - Decode
    - Execute

TYPES OF REGISTERS

1. MAR Register : The full form of MAR is the memory address register. The memory address register issued to fetch the instructions and data from the memory and helps to execute the instructions.

2. MDR : The full form of MDR register is a memory data register. The memory data register is used to store the data that will be stored or will be fetched from the computer memory

3. MBR : The full form of MBR is the memory buffer register. The memory buffer register is used to store information and data that can be read or written in the computer memory.



TYPES OF REGISTERS

4. PC: The full form of PC is the program counter register. The other name for the program counter register is instruction address register (IAR) or IC (instruction counter). The program counter is used to indicate the current position of program sequence in a computer system.

5. Accumulator : The accumulator is another type of central processing unit register that is widely used for storing the logic or intermediate results.

6. Index Register : The index registers a type of processor register in the central processing unit (CPU) that is widely used for altering the address of operand at the time of program execution.

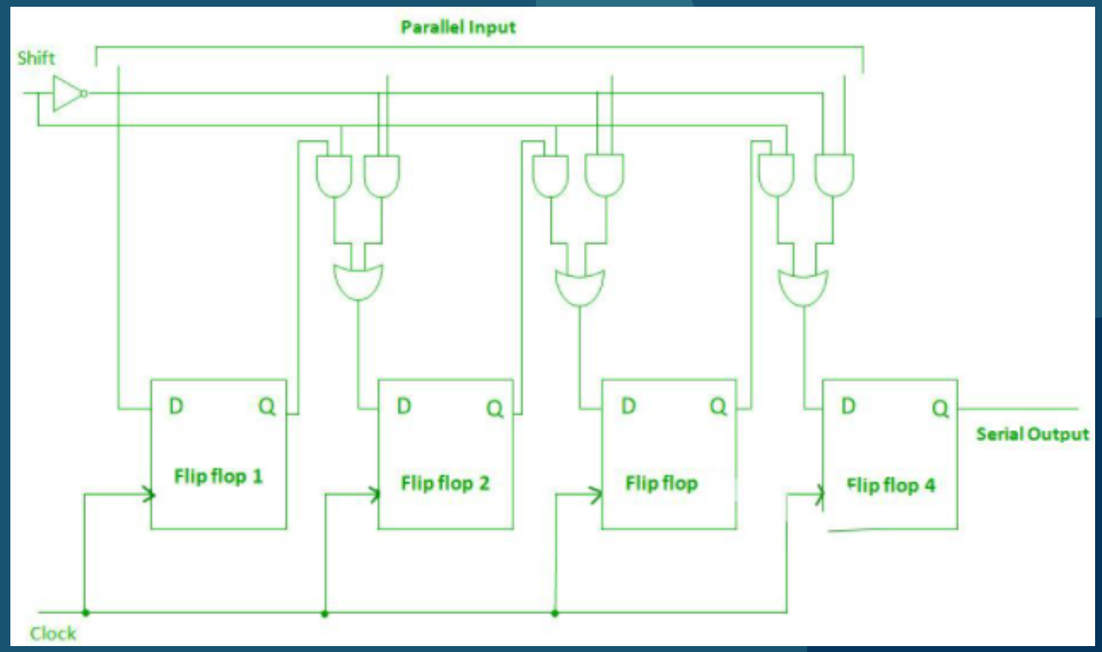
7. Instruction Register : The instruction register is another type of central processing unit register that is used to store the instruction that is currently executed or that will be decoded.

HOW DOES A REGISTER WORK?

WHY IS IT IMPORTANT TO US?

The register is a sequential logic circuit in digital electronics.

Register is a group of Flip-flops which can store more than one-bit data. In digital electronics Logic Gates, flip-flops, registers are very important and interesting topics because they are the basic components of Microprocessor, CPU, Memory etc.



SHIFT REGISTER

Shift Register is a group of flip flops used to store multiple bits of data. The bits stored in such registers can be made to move within the registers and in/out of the registers by applying clock pulses. An n-bit shift register can be formed by connecting n flip-flops where each flip flop stores a single bit of data.

SISO

SIPO

PISO

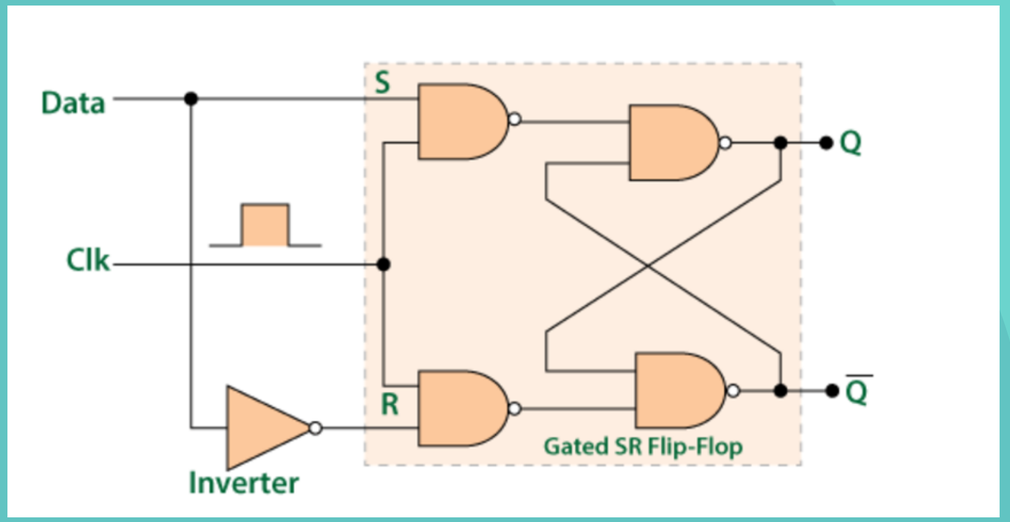
PIPO

D FLIP FLOP

1. D flip flop requires only one input. The other input signal is generated by taking complement of the first input signal.

2. This single input is called the “DATA” input.

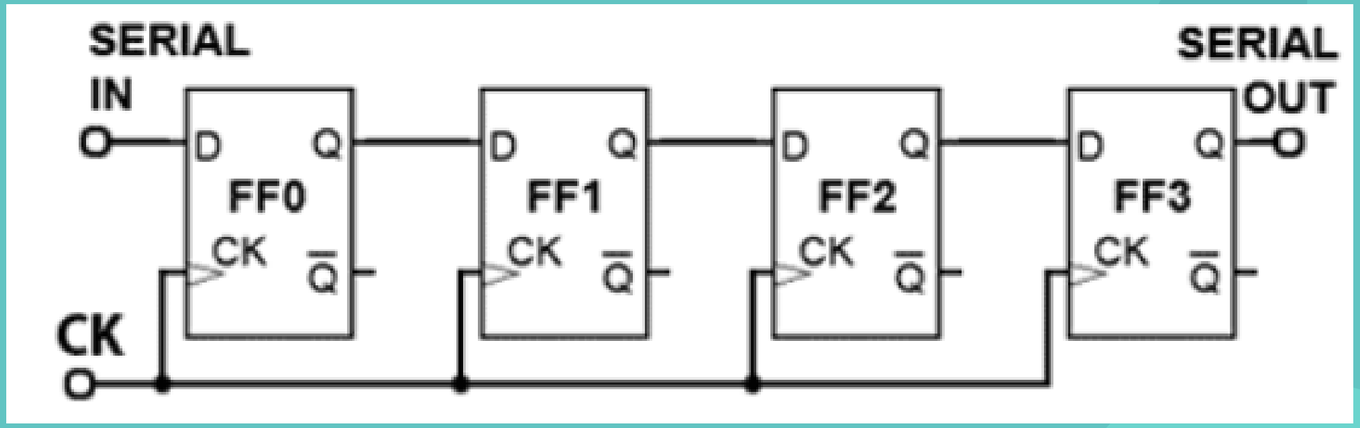
3. If the input data is HIGH, the flip flop is said to be SET. However, if the input data is low, the flip flop is said to be RESET.



Clk	D	Q		Description
↓ » 0	X	Q	$\overline{Q}$	Memory no change
↑ » 1	0	0	1	Reset Q » 0
↑ » 1	1	1	0	Set Q » 1

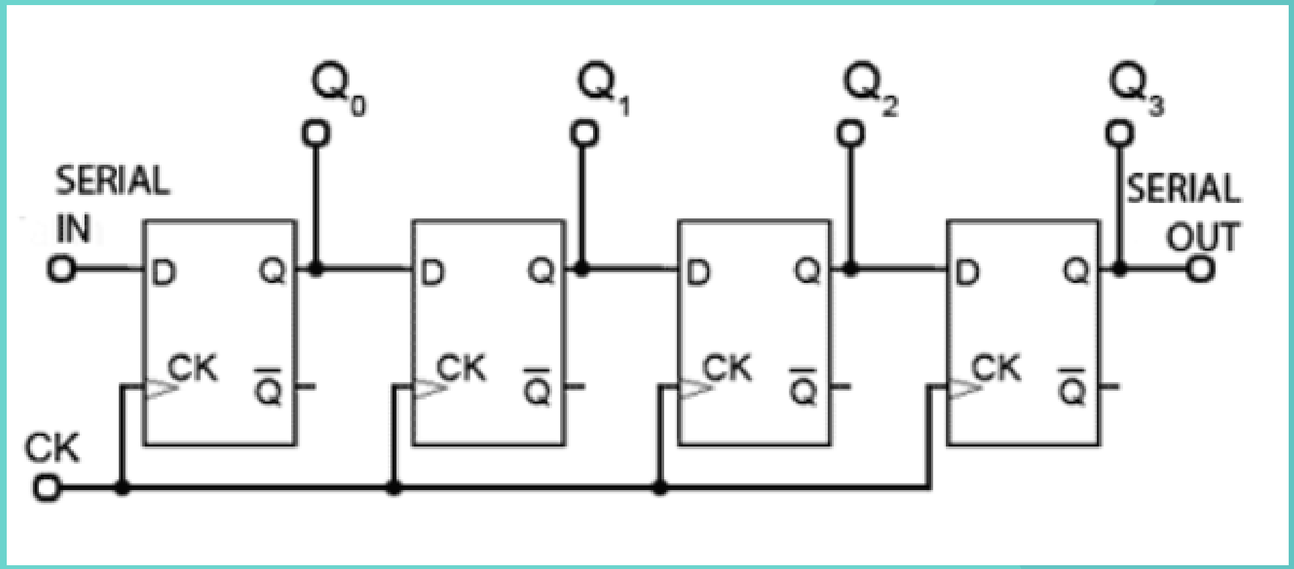
SISO

The circuit consists of four D flip-flops which are connected in a serial manner. The shift register, which allows serial input (one bit after the other through a single data line) and produces a serial output is known as Serial-In Serial-Out shift register. Since there is only one output, the data leaves the shift register one bit at a time in a serial pattern, thus the name Serial-In Serial-Out Shift Register.



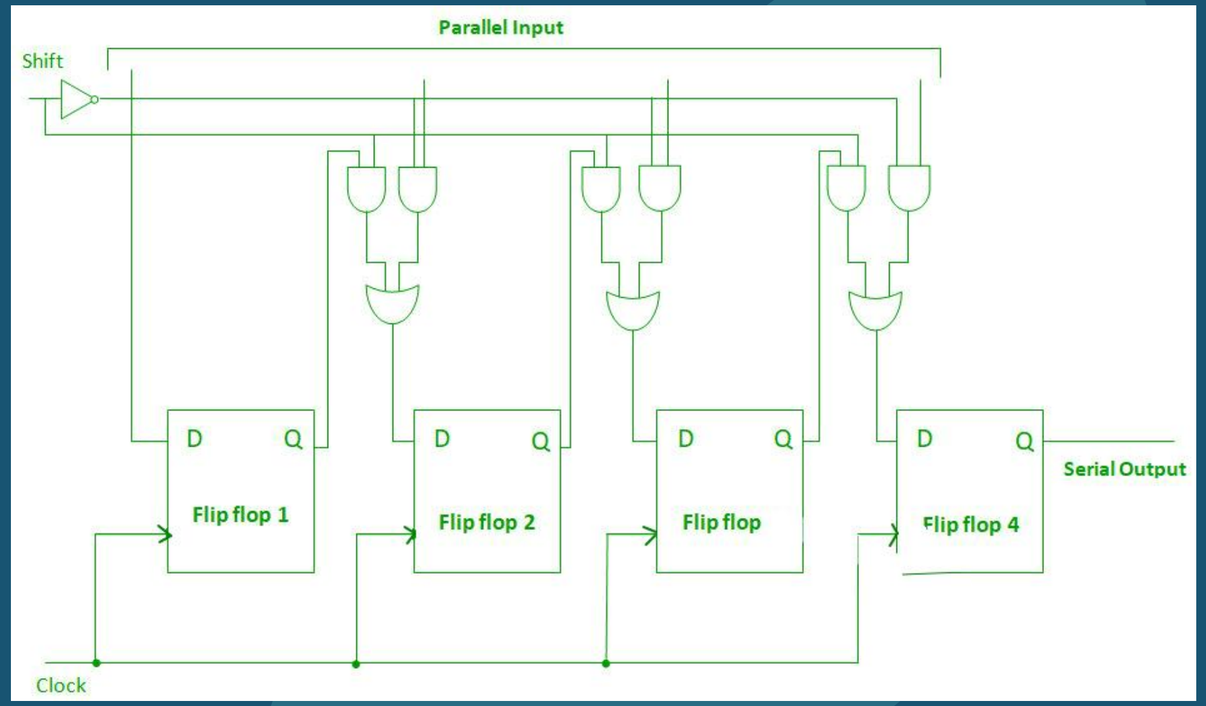
SIPO

The shift register, which allows serial input (one bit after the other through a single data line) and produces a parallel output is known as Serial-In Parallel-Out shift register. The logic circuit given below shows a serial-in-parallel-out shift register. The circuit consists of four D flip-flops which are connected. The output of the first flip flop is connected to the input of the next flip flop and so on.



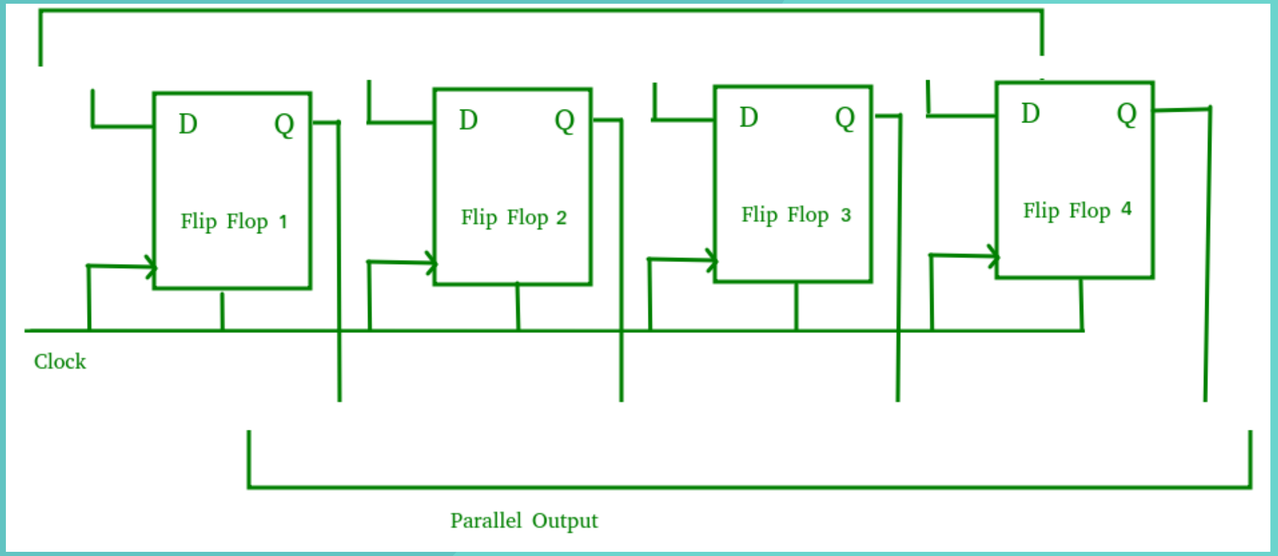
PISO

The shift register, which allows parallel input (data is given separately to each flip flop and in a simultaneous manner) and produces a serial output is known as Parallel-In Serial-Out shift register. The circuit consists of four D flip-flops which are connected. The clock input is directly connected to all the flip flops but the input data is connected individually to each flip flop through a multiplexer at the input of every flip flop. The output of the previous flip flop and parallel data input are connected to the input of the MUX and the output of MUX is connected to the next flip flop



PIPO

The shift register, which allows parallel input (data is given separately to each flip flop and in a simultaneous manner) and also produces a parallel output is known as Parallel-In parallel-Out shift register. The logic circuit given below shows a parallel-in-parallel-out shift register. The circuit consists of four D flip-flops which are connected. The clear (CLR) signal and clock signals are connected to all the 4 flip flops. In this type of register, there are no interconnections between the individual flip-flops since no serial shifting of the data is required.



PROCESSOR REGISTER

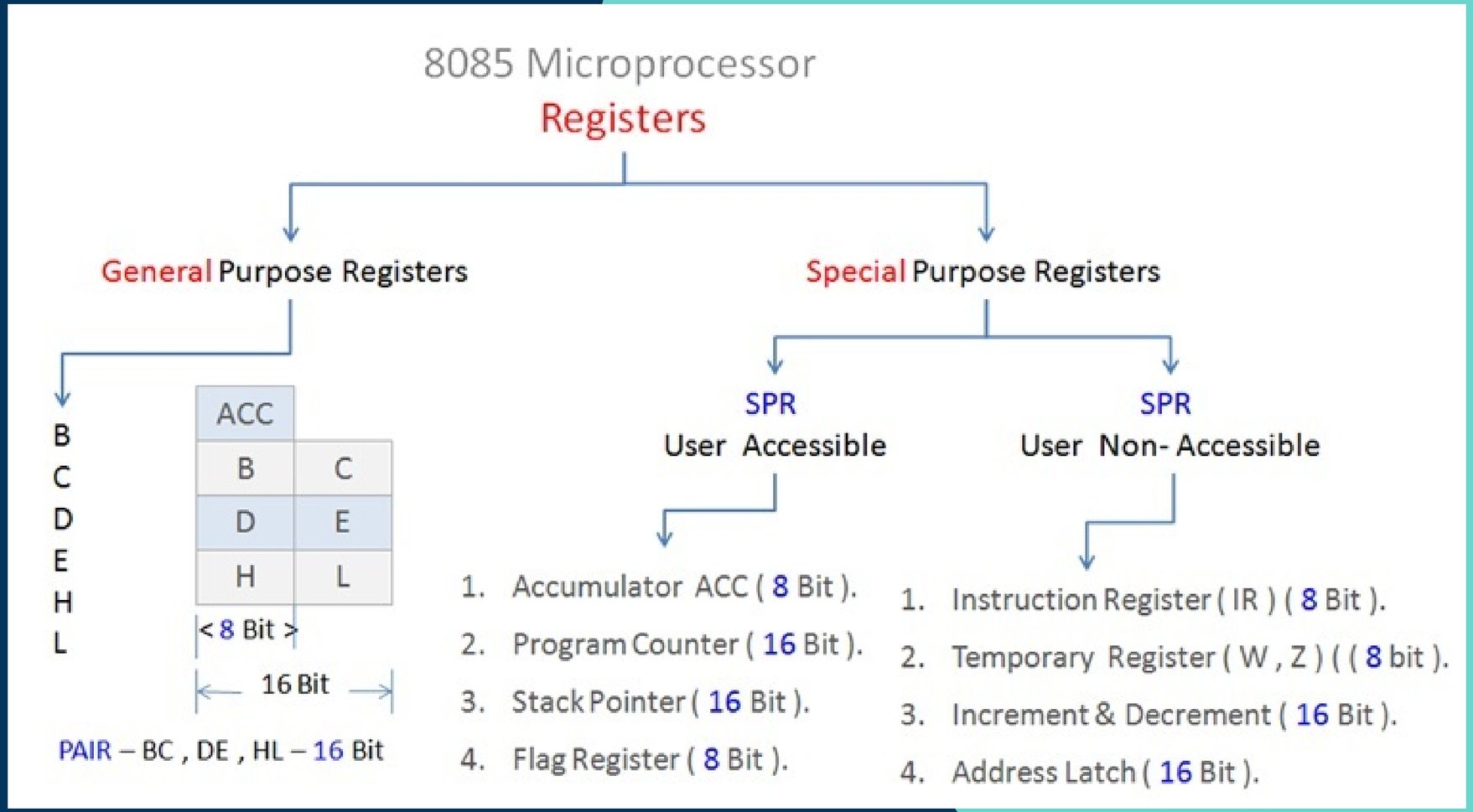
- A processor register is a local storage space on a processor that holds data that is being processed by CPU.

- Processor registers are normally made of static or dynamic random access memory (RAM) cells.

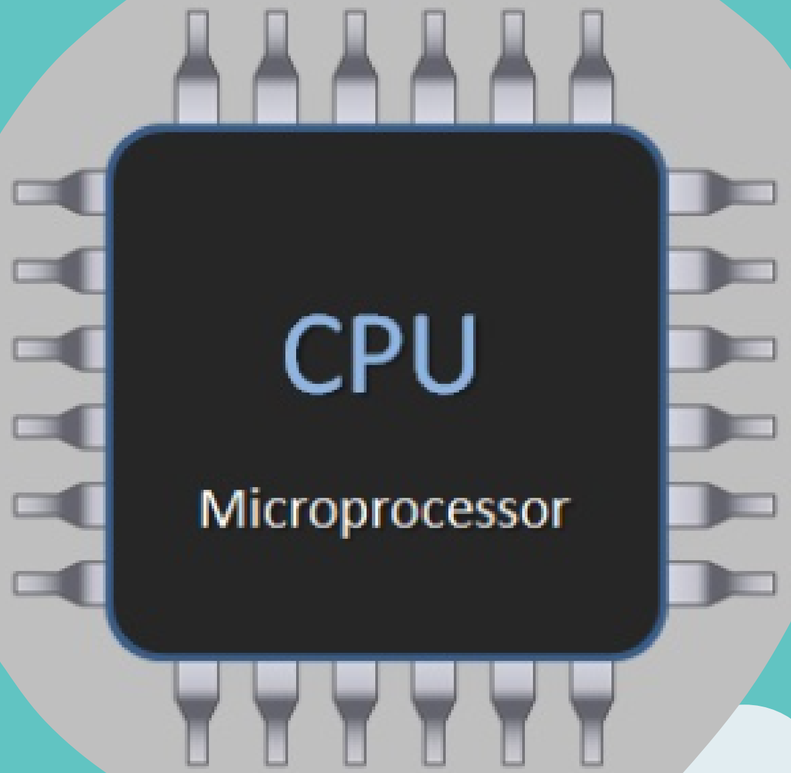
REGISTER FUNCTION IN COMPUTER ARCHITECTURE

- Processor registers can be classified into general-purpose and special-purpose registers.
- These can be categorized into several types based on the type of instructions being handled:

1. Conditional
2. Address
3. vector
4. Data
5. Control and status
6. Model-specific

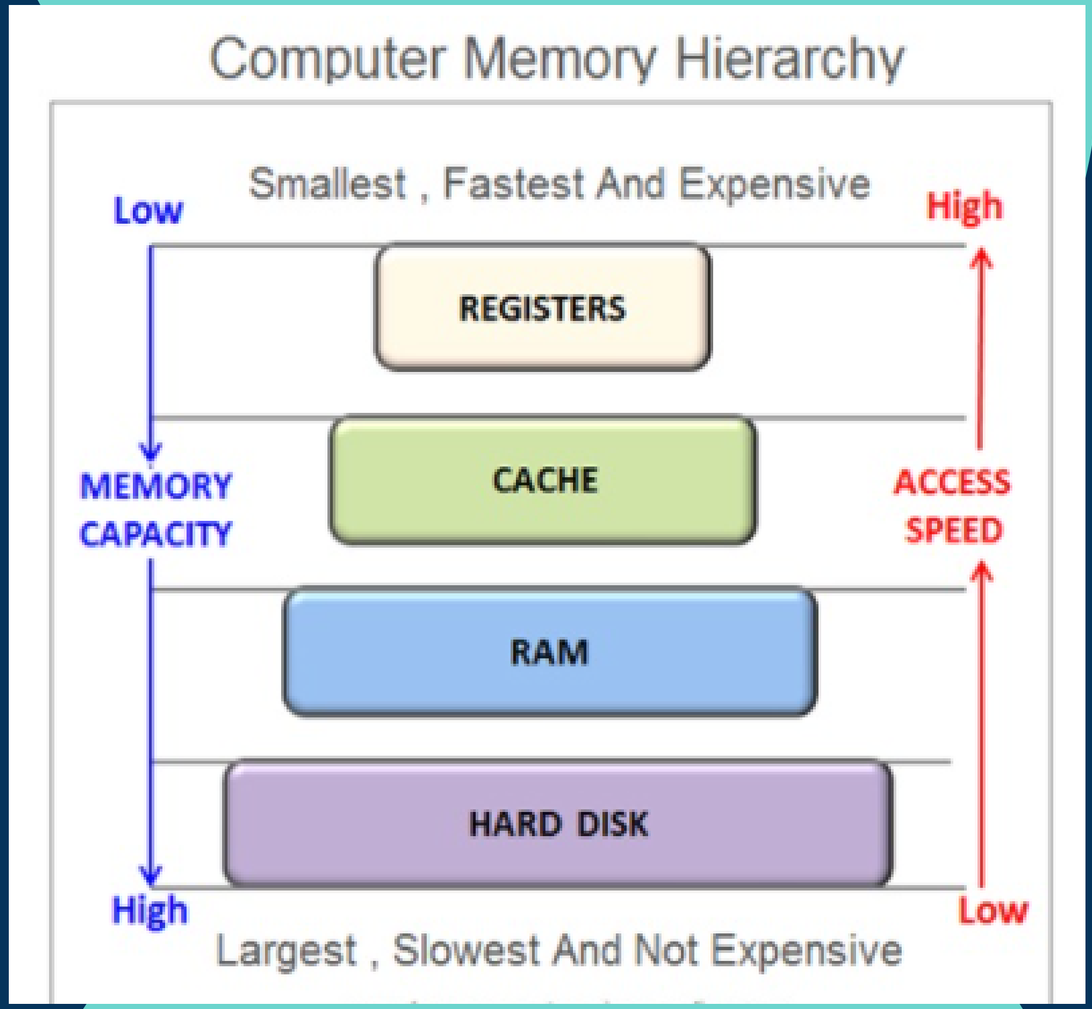


- The registers are high speed memory placed inside the processor chip that provides quick data access to the CPU.
- The registers are part of the internal temporary storage used by the CPU.
- It is used by the CPU at different stages of the instruction cycle.



REGISTERS AND MEMORY HEIRARCHY

The registers are the smallest but the fastest component of the memory hierarchy used in the computer architecture.



- The secondary memory (disk memory) is the largest in size but provides lowest data access speed.
- The CPU's execution speed is very high. Whereas, the main memory RAM cannot match the execution speed of CPU

Thank You!!