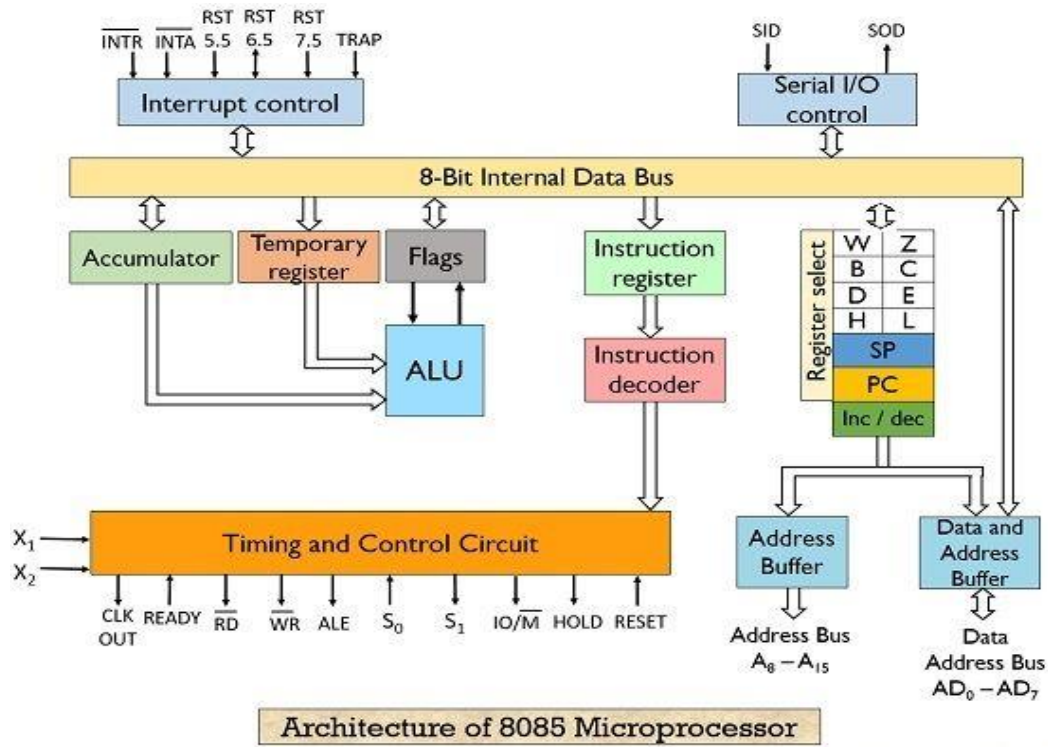


## 8085 Microprocessor architecture

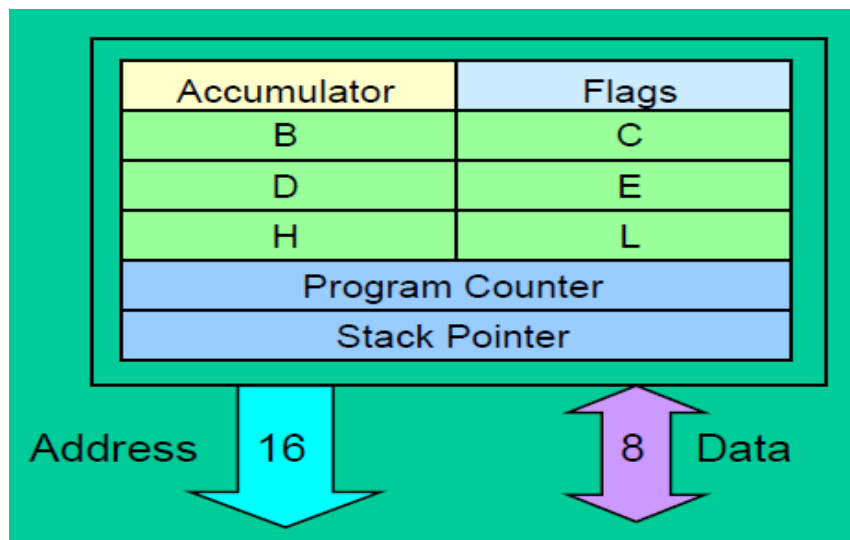
In general, the microprocessor system contains from two basic parts are hardware and software. The hardware of 8085  $\mu$ p included three parts are registers group, ALU and control unit:



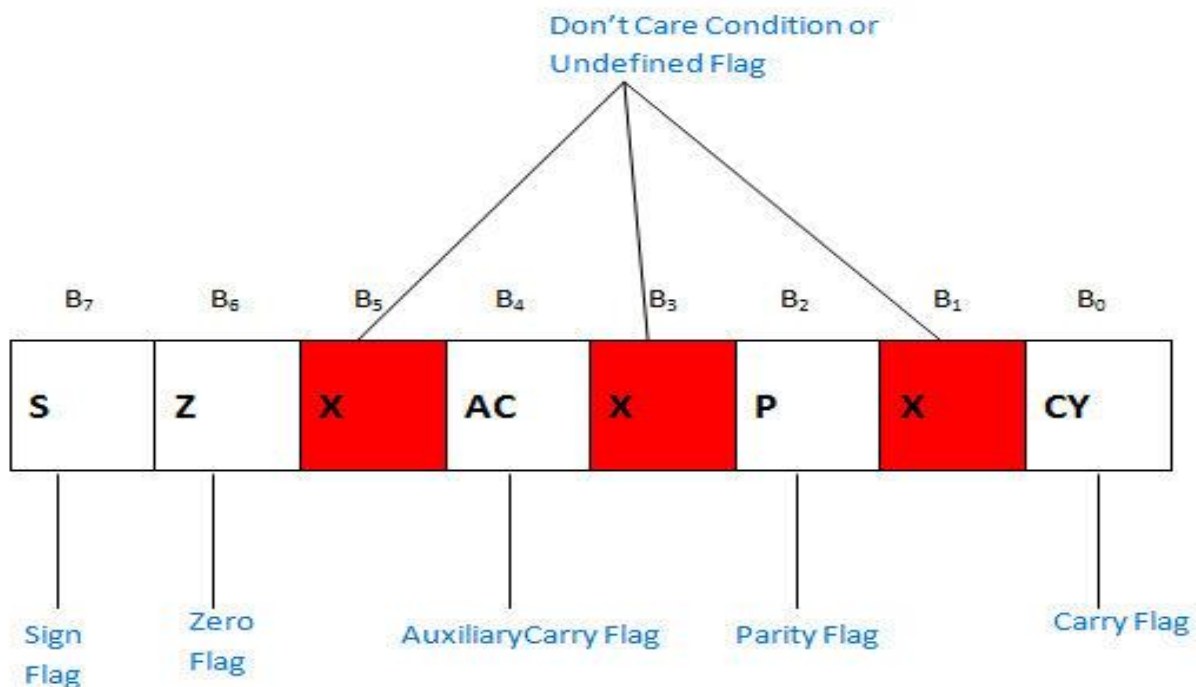
Architecture of 8085 Microprocessor

Electronics Desk

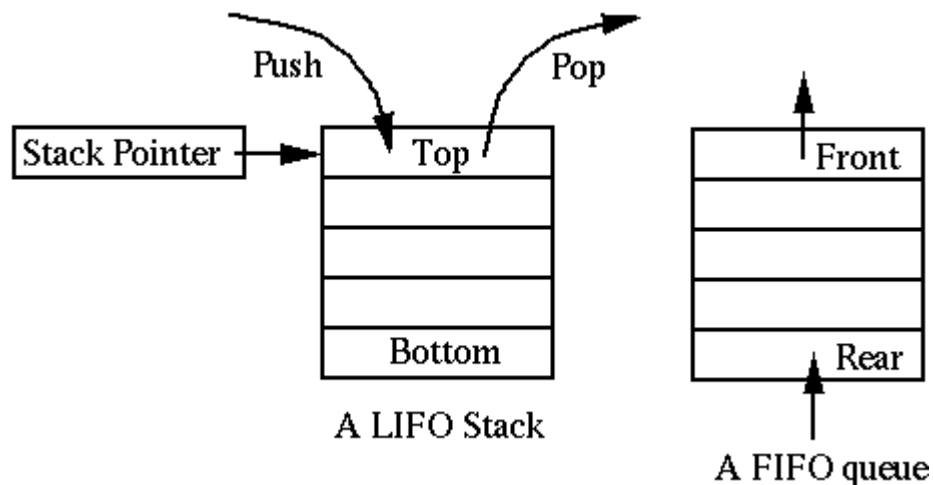
1. **Group of Registers:** there are two types of registers in 8085 microprocessor as shown below:



- a) **General Purpose Register**: GPRs are six (8-bit) registers used to store data temporarily during execution of programs, these registers are **(B, C, D, E, H, and L)**.
- 8-bit B and 8-bit C registers can be used as one 16-bit BC register pair. When used as a pair the C register contains low-order byte.
  - 8-bit D and 8-bit E registers can be used as one 16-bit DE register pair. When used as pair the E register contains low-order byte.
- b) **Special Purpose Register**: SPRs are used to achieve special task as shown below:
- **Accumulator(A)**: Accumulator is an 8-bit register which used as part of the Arithmetic/Logic unit (ALU) to perform arithmetic and logic operations and the results of these operation stored in accumulator.
  - **Flag Register (F)**: Flag register is an 8-bit register used to indicate the status of five flags after execute the arithmetic or logic operation. It consists of 5 flip flop which changes its status according to the result stored in an accumulator. The distribution of flags on flag register is shown in figure below:



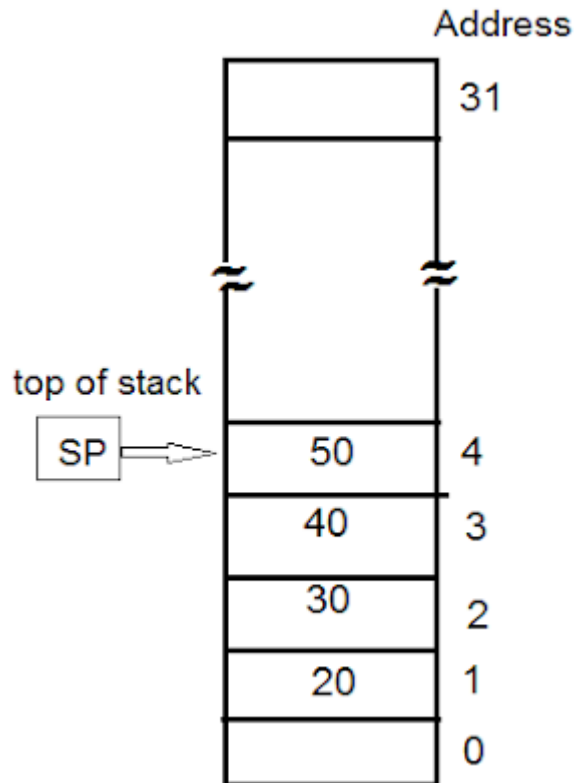
- **CY:** carry flag where is one if found carry from MSB and zero if no carry from MSB of the arithmetic or logic operation.
  - **P:** parity flag where is one if the parity of result of arithmetic and logic operation is even and zero if parity of arithmetic and logic operation is odd.
  - **AC:** auxiliary carry flag where is one if carry found from fourth bit F3 and zero if no carry from F3 of the arithmetic or logic operation.
  - **Z:** zero flag where is one if the result of arithmetic and logic operation is zero and zero if any result found.
  - **S:** sign flag where is one if the seventh bit (F7) of arithmetic and logic operation is one and zero if the seventh bit (F7) of arithmetic and logic operation is zero.
- **Stack Pointer (SP):** the stack pointer is 16-bit register used to point to the memory locations called stack. Generally stack is a reserved portion of memory where information can be stores or taken back together.



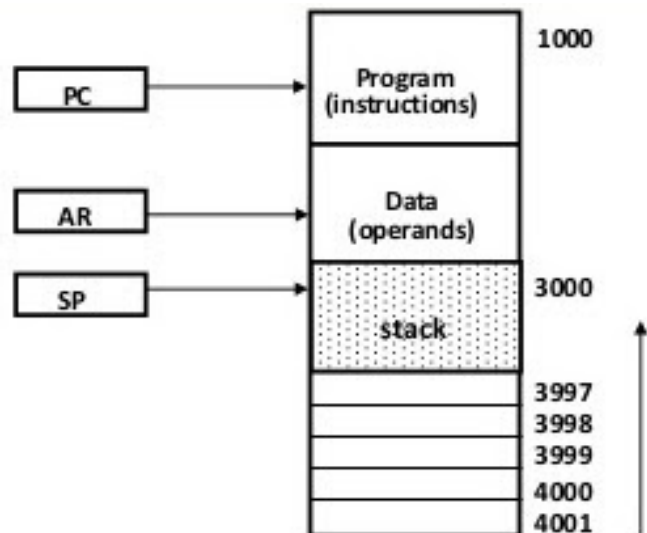
### **Example:**

- Four element store in stack.
- The data element 50 is top of stack, therefore the content Of SP is now 4.
- The stack pointer is a 5 bit register, because  $2^5=32$ .
- Initially it is clear to 0 and stack is said to be empty.

- When data element is pushed on the stack, SP incremented.



- **Program counter (PC):** PC is 16-bit register used to stores the memory address of the next instruction to be executed , on the other hand used to sequence the execution of instructions.



- **Instruction Register/Decoder**: it identifies the instructions, it takes the information from instruction register and decodes the instruction to be performed.
  - **Temporary Register**: It is also called as operand register (8 bit).It provides operands to ALU. ALU can store immediate result in temporary register. It is not accessible by user.
  - **Increment/decrement register**: This 16-bit register is used to increment or decrement the content of program counter and stack pointer register by 1.
2. **Arithmetic/Logic Unit (ALU)**: this unit is part of microprocessor contain from digital circuits which used to execute the arithmetic and logic operation of data that stored in general purpose register or directly data. The result of most arithmetic and logic operation are saved in accumulator.
  3. **Control Unit**: this part of microprocessor is responsible of provides the necessary timing and control signals which organize flow of data between the microprocessor and memory or peripherals devices.
  4. **Interrupt control**: it controls the interrupts during a process. When a microprocessor is executing a main program and whenever an interrupt occurs, the microprocessor shifts the control from the main program to process the incoming request. After the request is completed, the control goes back to the main program.
  5. **Serial Input/output control**: It controls the serial data communication by using these two instructions: SID (Serial input data) and SOD (Serial output data).
  6. **Address buffer and address-data buffer**: The content stored in the stack pointer and program counter is loaded into the address buffer and address-data buffer to communicate with the CPU. The memory and I/O chips

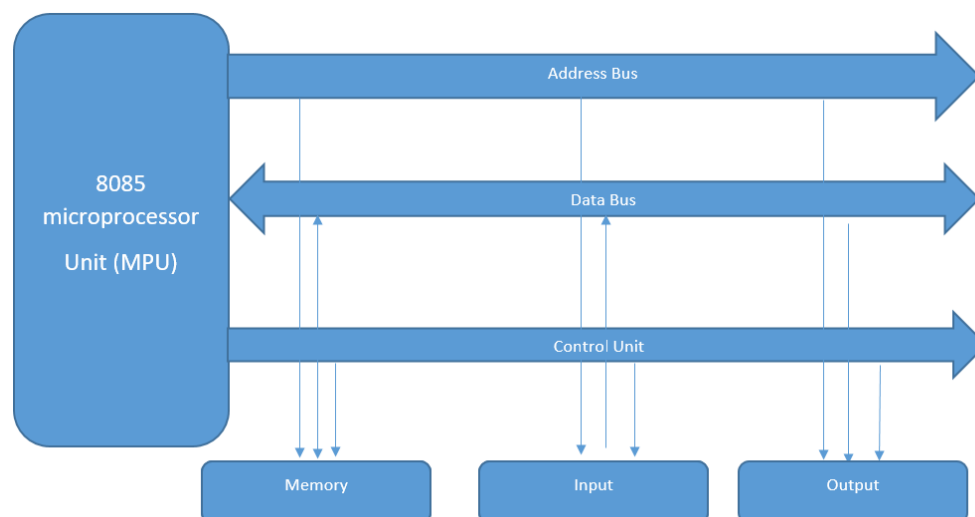
are connected to these buses; the CPU can exchange the desired data with the memory and I/O chips.

7. **Bus Organization:** A bus organization is a group of conducting wires which carries information, all the peripherals are connected to microprocessor through the bus. A system bus is nothing just a group of wires to carry bits.

The MPU (Micro Processing Unit) performs primarily four operations:

- Memory Read: Read data (or instructions) from memory.
- Memory Write: Write data (or instructions) into memory.
- I/O Read: Accepts data from I/P devices.
- I/O Write: Sends data to O/P devices.

The diagram to represent the bus organization of 8085 microprocessor is given below:-



Types of Bus in the microprocessor are:-

1. Address Bus
2. Data Bus
3. Control Bus

1. **Address Bus:** The address bus carries information about the location of data in the memory. The address bus is unidirectional because of data flow in one direction, from the microprocessor to memory or from the microprocessor to input/output devices. Length of Address bus of 8085 microprocessor is 16 bit (That is, four hexadecimal digits), ranging from 0000H to FFFF H. The microprocessor 8085 can transfer maximum 16-bit address which means it can address 65,536 different memory location i.e 64KB memory. Address Bus is used to perform the first function, identifying a peripheral or a memory location.
2. **Data Bus:** The data bus allows data to travel between the microprocessor (CPU) and memory (RAM). The data bus is bidirectional because of data flow in both directions, from the microprocessor to memory or input/output devices and from memory or input/output devices to microprocessors. Length of Data bus of 8085 microprocessor is 8 bit (that is, two hexadecimal Digits), ranging from 00H to FF H. the data bus is used to perform the second function, transferring binary information.
3. **Control Bus:** The control bus carries the control signals to control all the associated peripherals.