1.List the features of the 8085 processor.

1.8 bit microprocessor.

2. provides 16 bit address bus.

3. it requires +5v power supply.

4. It has on chip clock generator.

5. It's maximum clock frequency is 3 MHz

6. provides 74 instructions

7. single chip NMOS device.

2. Differentiate between 8085 and 8086 processor.

8085	8086
8 bit microprocessor	16-bit microprocessor
16-bit address bus	20-bit address bus
General purpose regi. Size are of 8 -bit	General purpose regi. Size are of 16 -bit
Instruction queue is not present	6 byte Instruction queue is present
Segmentation is not supported	Segmentation of memory is supported
Doses not support pipeline architecture	support pipeline architecture
Maximum clock frequency is 3MHz	Maximum clock frequency is 8MHz

3.State the function of ALU in 8085.

The 8-bit ALU performs arithmetic operations such as addition, subtraction, and logical operations such as AND,OR and XOR on 8 bit data at a time. It takes operand from the 8 bit temporary register and 8 bit accumulator. After performing the operation the result is placed in accumulator.

4.list all general purpose registers of 8086.

1. AX

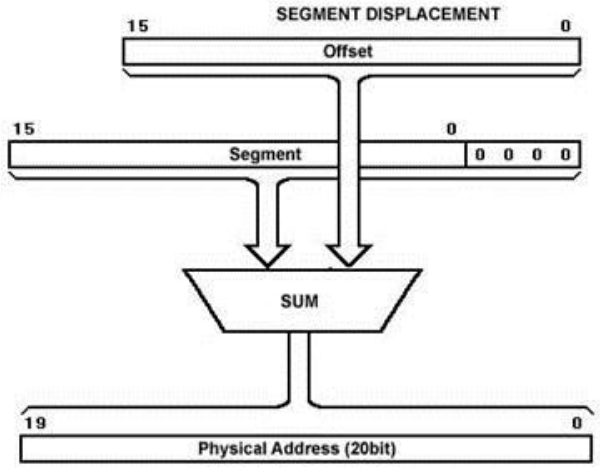
2.BX

3.CX

4.DX

.

5.**Describe the physical address generation steps. With example.**



- The 8086 microprocessor has 20 bit address pins so that each memory location connected with the microprocessor have 20 bit address. This 20 bit address of memory is called as physical address.
- The physical address of memory location is calculate by adding a segment address and offset address of that memory location .
- The adder do the addition of segment address with '0' and offset address and generates 20-bit physical address is generated.
- E.g.
  Segment address 2494
  Offset address 0006
  24940
  +0006
  _____
  24946 physical address.

6.write difference between maskable and non-maskable interrupts.

Non maskable	maskable
Cannot be avoided by microprocessor	Can be avoided by microprocessor
Edge as well as level triggered	May be either edge or level triggred
Response time is fast	Response time slow
No instruction is available for masking	Instruction is available for making
Eg. TRAP	e.g. INTR

7. Explain flag register of 8085?

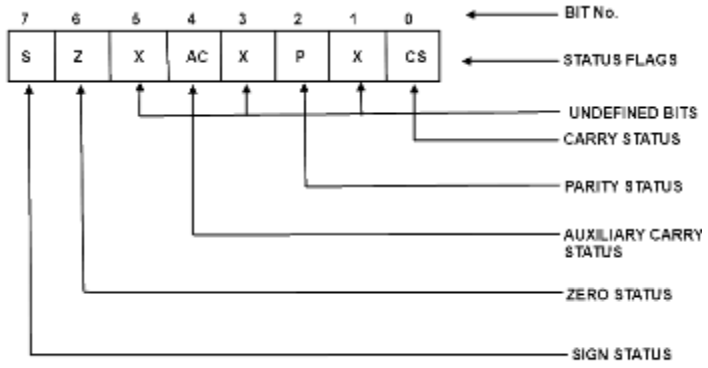
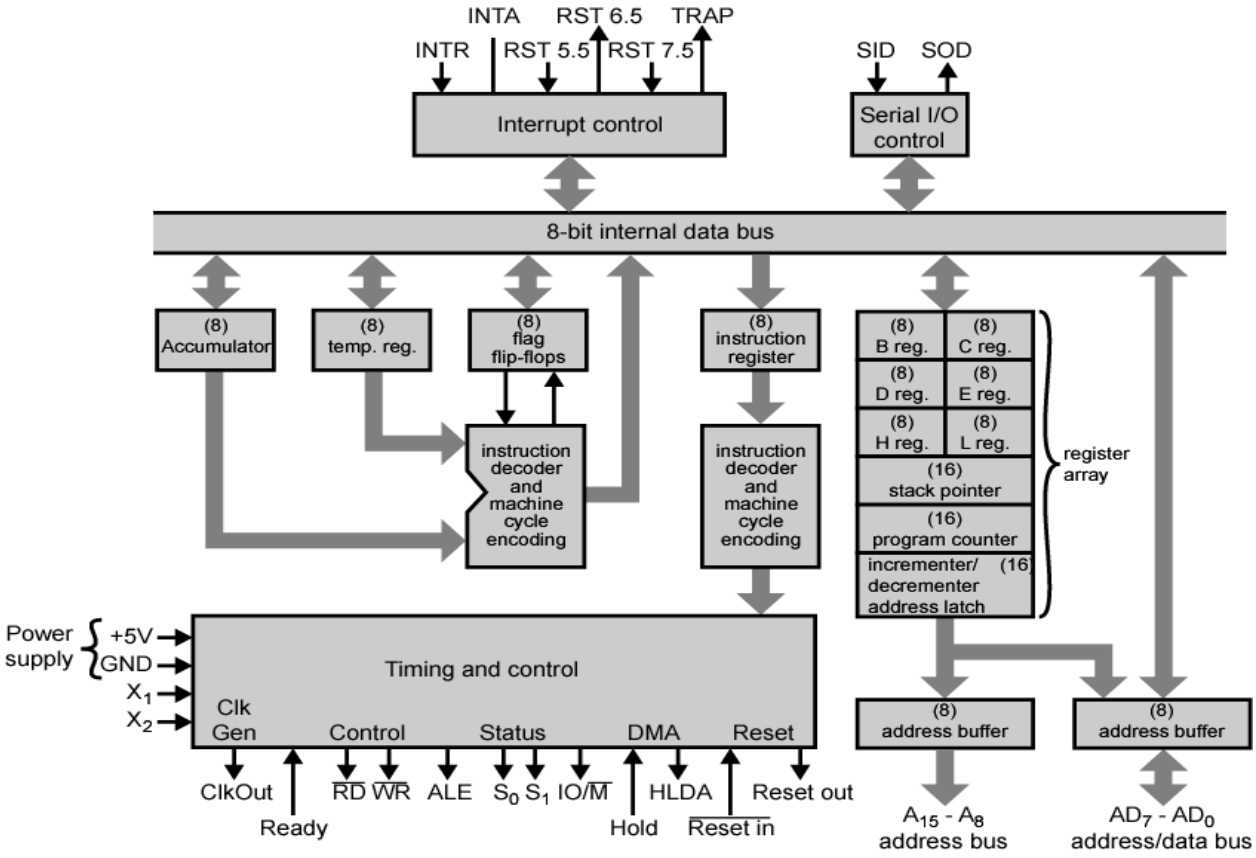


Figure 2: Status Flags of Intel 8085

- There is also a flag register whose bits are affected by the arithmetic & logic operations.
  - S-sign flag
    - The sign flag is set if bit D7 of the accumulator is set after an arithmetic or logic operation. If set then says –ve sign otherwise +ve
  - Z-zero flag
    - Set if the result of the ALU operation is 0. Otherwise is reset. This flag is affected by operations on the accumulator as well as other registers. (DCR B).
  - AC-Auxiliary Carry
    - This flag is set when a carry is generated from bit D3 and passed to D4 . This flag is used only internally for BCD operations.
  - P-Parity flag
    - After an ALU operation, if the result has an even of 1s, the p-flag is set. Otherwise it is cleared. So, the flag can be used to indicate even parity.
  - CY-carry flag
    - This flag is set when a carry is generated from bit D7 after an additon operation.

8.Explain 8085 architecture with block diagram.



> **Note :** Output of flag register is not directly accessible to the user. But we can get the flag register and manipulate INDIRECTLY, with software techniques. But wait till we study, instruction set.

The different flags and their positions in flag register are as shown in Fig. 4.6.

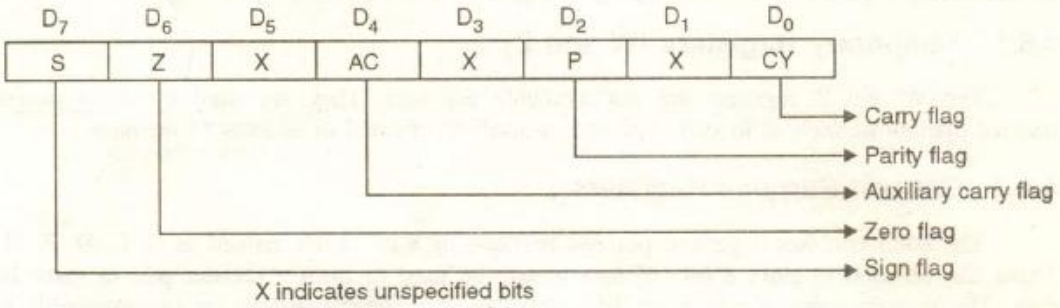


Fig. 4.6 : 8085 flag register

(1) **CY** **Carry flag :** If an operation performed in ALU, generates a carry from D_7 bit, the CY flag is SET. It works as 9^{th} bit for addition and as borrow flag for subtraction. If there is no carry/borrow, out of MSB bit, i.e. D_7, of the result, CY flag is RESET.

(2) **AC** **Auxiliary carry flag :** If an operation performed in ALU generates a carry from lower nibble (i.e. D_0 to D_3) to upper nibble (i.e. D_4 to D_7) the AC flag is set i.e. a carry given by D_3 bit to D_4 is a AC flag.

This is not a general purpose flag, it is only used internally by microprocessor to perform binary to BCD conversion. It is not available for programmer for any decision making.

(3) **Z** **Zero flag :** If an operation in ALU results in zero, the zero flag is SET. If the result is not zero, the zero flag is RESET.

(4) **S** **Sign flag :** In sign magnitude format, the sign of a number is indicated by MSB bit. If MSB bit = 0, the number is positive and if MSB bit = 1, the number is negative. In 8085 MSB bit is D_7 bit. The sign flag is exact replica of D_7 bit of the result. If D_7 = 1, the flag is set and if D_7 = 0, the flag is reset. This flag can be used to perform operation on signed numbers.

(5) **P** **Parity flag :** This bit is used to indicate the parity of the result. If the result contain even number of 1's this flag is set. If the result contains odd number of 1's this flag is reset. i.e. by insertion of flag bit microprocessor maintains odd parity for result.

> **Note :** In 8085 overflow flag is not present. Basically, the overflow flag and carry flag are not same. The overflow flag is used by other processor Ex. 8086. It is used to indicate overflow condition. It is set if the result of a signed operation is too large to fit in the number of bits available. When we want to represent signed numbers (i.e. positive and negative numbers) we use 2's complement sign magnitude form. In this form the MSB is used as a sign bit and remaining 7 bits are used as magnitude. So for an 8 bit number the allowed range of numbers is + 127 to −128. When result of any arithmetic operation exceeds this limit, this indicates an overflow condition. In 8085 overflow condition can be checked by checking D_7 bit of operands and result.

4.6 Register Group :

This group consists of 3 types of registers :
(i) Temporary registers (ii) General purpose registers (iii) Special purpose registers.

4.6.1 Temporary Registers (W and Z) :

The W and Z registers are not available for user. They are used by microprocessor for internal operations such as to store operand, immediate operand or address of memory.

4.6.2 General Purpose Registers :

The 8085 contains 6 general purpose registers of 8 bits each, named as B, C, D, E, H and L. These can be used to store 8 bits of data or can be used to form a register pair to store 16 bit of data. The register pairs available are BC, DE and HL. These registers are programmable by user. User can store any data in these registers and use it to perform different operations.

4.6.3 Special Purpose Registers :

The 8085 contains 3 special purpose registers such as program counter, stack pointer and incrementer / decrementer latch.

(a) Program counter : This is a 16 bit register used for execution of program. This register always points to address of memory from where the next instruction is to be fetched and executed. When microprocessor performs one operation of taking instruction i.e. fetching, the PC contents are automatically incremented by one to point to next location. In this way, PC keeps the track for execution of program. ***Upon reset PC contents are set to 0000 H, so after reset operation, microprocessor will start execution of program from 0000 H onwards.***
The program counter is of 16 bits. The main reason behind this is that the 8085 contains 16 address lines. By using 16 address lines one can select any memory location in the memory map of 8085.

(b) Stack pointer : This is a 16 bit register used to define the stack starting address. Stack is a reserved portion of memory where register pair information can be stored or taken back under software control. The stack pointer is used to keep track of data stored on stack. [Refer section 3.8.7 in chapter 3 for operation in stack].

(c) Incrementer/decrementer latch : This 16 bit register is used to increment or decrement the contents of PC and SP registers. In coordination with these registers, two buffers are used.

(A) Address buffer : This is an 8 bit unidirectional buffer used for A_8 to A_{15} address lines. These are used to output higher order address on A_8 to A_{15}. When they are not in use or under certain conditions such as reset, hold, halt, this buffer is used to tristate A_8 to A_{15} address lines.

(B) Address/data buffer : This is an 8 bit bidirectional buffer used for address/data. The address/data signals are multiplexed on AD_0 to AD_7 lines. In earlier part it is used to output lower order address A_0 to A_7 and in later part it is used to input or output data D_0 to D_7. The address is taken from address lines and data is taken or transferred on internal data bus. Under certain condition such as reset, hold, halt this buffer is used to tristate AD_0 to AD_7 address/data lines. The various sources of addresses for the address register includes program counter, stack pointer, temporary registers, BC pair, DE pair and HL pair. These are as shown in Fig. 4.7.

9. Explain following pins of 8086?

1. TEST# 2.DT/R# 3. RD# 4.BHE#

1. TEST#-this signal is used to test the status of math co-processor 8087. The BUSY# pin of 8087 is connected to this pin of 8086 this input signal examined by WAIT instruction. If the TEST# signal goes low execution will continue else the processor remains in an idle state.

2.DT/R# - data transmit and receive

This output pin decides direction of data. If this signal high then processor transmit data otherwise receive data.

3. RD#- if this pin is active low then processor performs I/O or memory read operation.

4.BHE#- the bus high enable signal is used to indicate the data transfer over the (D8-D15) data bus