

# 8086 FLAG REGISTER

---

Course Teacher

Shaila Rahman

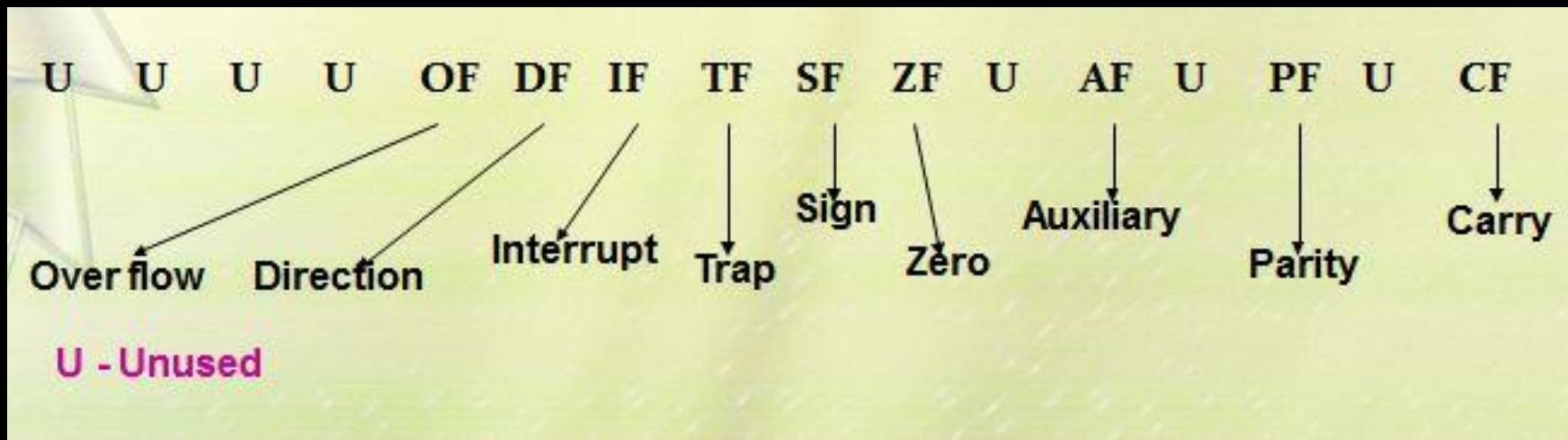
# FLAG REGISTER

8086 Flag Register is 16-bit. Each bit indicates a flag. Each flag is a **flip flop** which **indicates some conditions (0/1)** produced by the execution of an instruction or **controls certain operations** of the EU.

Characteristics:

- I. The EU contains Flag Register
- II. It is 16 bit register
- III. Among the 16 flags , 9 are active flags and remaining 7 are undefined
- IV. 6 flags indicates some conditions- status flags, those set/reset auto.
- V. 3 flags are control Flags, set/reset by programmer to get certain facilities.

# FLAG REGISTER



The Flag register diagram

# CONDITIONAL FLAGS

## 1. CF –Carry Flag

Holds the carry after addition or the borrow after subtraction. This is used by unsigned arithmetic. If the result exceeds the size of destination CF=1, otherwise 0. CF becomes set if the unsigned scale range is exceeded.

## 2. PF- Parity Flag

Usually parity is an error detection procedure. This counts no. of ones in result. If the no. of one's count in result is even the PF=1, otherwise PF=0

PF=0;odd parity, PF=1;even parity

## 3. AF- Auxiliary Flag

This carry flag is used in BCD arithmetic operation. Holds the carry (half – carry) after addition or borrow after subtraction. Usually if a carry generates from bit positions 3 towards bit position 4 of the result , then AF=1, otherwise 0.

# CONTINUED...

## 4. ZF-Zero Flag

Shows the result of the arithmetic or logic operation. If the result becomes zero, then  $ZF=1$ ; otherwise  $ZF=0$ ;

## 5. SF-Sign Flag

This flag is used in signed arithmetic operation. This holds the sign of the result after an arithmetic/logic instruction execution.  $SF=1$ ; for negative result,  $SF=0$ , for positive result, while the MSB (Most Significant Bit) of the result indicating the sign.

## 6. OF- Overflow Flag

Overflow occurs when signed numbers are added or subtracted i.e. this is used by signed arithmetic operations. . An overflow indicates the result has exceeded the capacity of sign range. In expression

$OF = \text{Cout} \text{ XOR } \text{Cout}-1$

# CONTROL FLAG

## TF-Trap Flag

Enables the trapping through an on-chip debugging feature. This provides debugging facility. TF=1, the processor executes one instruction at a time.

## IF-Interrupt Flag

Controls the operation of the INTR (interrupt request) IF=0; INTR pin disabled. IF=1; INTR pin enabled and all maskable interrupts are recognized by CPU.

## DF- Direction Flag

It selects either the increment or decrement mode for DI and /or SI registers during the string instructions. DF=0, auto increment of SI/DI, DF=1, auto decrement of SI/DI.

These control flags are programmable.

# EXECUTION UNIT – FLAG REGISTER

- Six of the flags are **status indicators** reflecting properties of the last arithmetic or logical instruction.
- For example, if register AL = 7Fh and the instruction ADD AL,1 is executed then the following happen

**AL = 80h**

**CF = 0**; there is no carry out of bit 7

**PF = 0**; 80h has an odd number of ones

**AF = 1**; there is a carry out of bit 3 into bit 4

**ZF = 0**; the result is not zero

**SF = 1**; bit seven is one

**OF = 1**; the sign bit has changed

EXAMPLE

10011010

10001001

---

100100011



CF

Thus  $CF=1, ZF=0, PF=0, SF=0, OF=1, AF=1$