EX :If the code segment register contain 1400ʰ and the IP register contains 1200ʰ . find the address of the next instruction to be fetched by the MP.

Sol

PA = 1400 0 + 01200 = 15200ʰ

H.W

If SS: SP = 1234 : 4200

Find the physical address for the memory location in the active stack segment .

Execution unit (EU)

The execution unit is responsible for **decoding and executing** all instructions . the EU **consist of three main part** :-

1- ALU
2- 8- general purpose register
3- Status and control flags (flag register)

The EU extract instructions from the top of queue in the BIU , decoding them , generate operand address if necessary , pass them to the BIU and requests it to perform the read or write bus cycles to memory or I/O , and performs the operation specified by the instruction on the operands , some of the status and control flags may be affected due to the execution of the instructions .

1- ALU

It is the unit of the EU in which all the operation specified by the MP instruction are performed , more specifically it performs all the arithmetic , logic , and shift instruction .

2- General purpose register

There are eight general purpose register exist in the EU , these register can be divided into :-

1- Data register :- four 16- bits data register .
2- Pointer & Index register :- two 16-bits pointer register and two 16-bits index registers .

Data register

It is a temporary storage location inside the EU , used during instruction execution . each data register can be used as one 16-bits register or as two 8- bits registers .

Reference to register as 16- bits word are identified by an (X) after the register letter such as AX , CX . while reference to it as 8- bit byte register . its high byte or low byte are identified by (H , L) after the register letter such as AH , AL .

AX (Accumulator)

It is a general purpose register and it is specially used for instruction such as multiplication , division , and some of the adjustment instructions .

BX (Base)

A general purpose register and sometimes used to holed the offset address of a location in the memory system .

CX (count)

It is a general purpose register and also used as a count register for multiple shifts

Of rotates , looping , instruction , and string operations .

DX (data)

It is a general purpose register that holds part of the result from multiplication or division .

Pointer & Index registers

There are four 16- bits registers two serve as pointers and two serve as indexed . these registers usually store offset address used for addressing within a segment .

Stack pointer (SP)

It is a 16 bit pointer used to hold an offset for the memory location within the stack segment to store on it .

Base pointer (BP)

It also represents an offset from the SS register . However it is used to access data within the stack segment .

Source Index (SI)

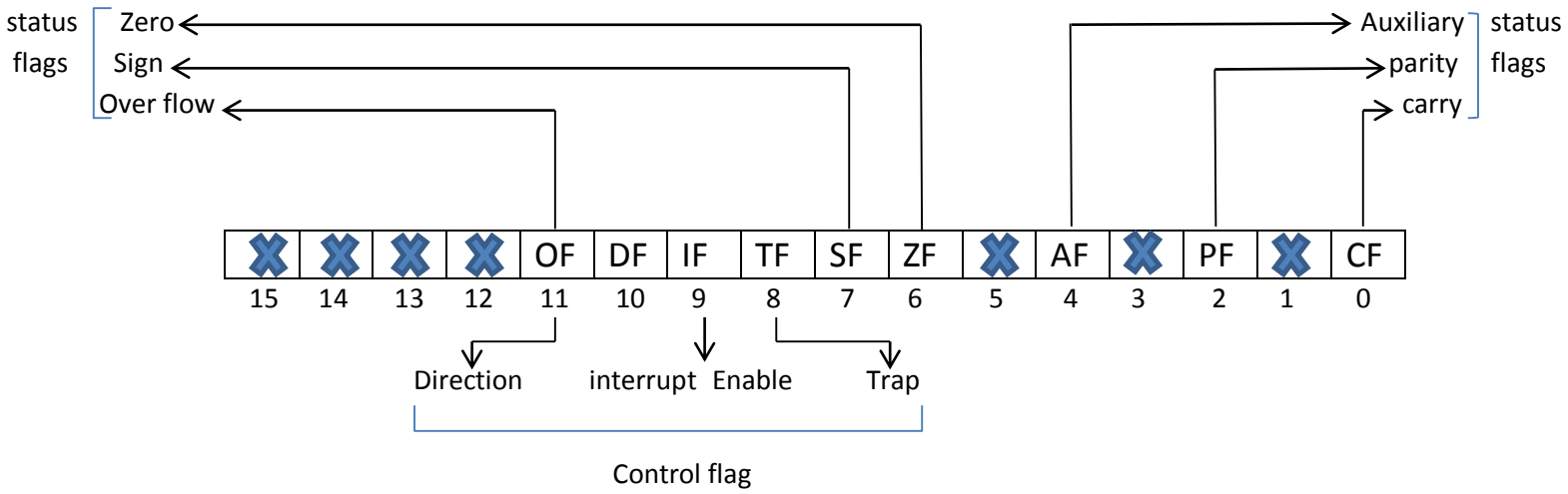
It is a 16- bits register used to hold the offset address for a source operand in the data segment (DS) .

Data Index (DI)

It is a 16- bits register used to store the offset address for a destination operand in the DS .

Flag register

It is a 16- bits register within the EU . However only 9- bit are used in this register as shown these 9- bits are divided into six status flags and three control flags



- **Status flags**

The EU set/reset these flags according to the result of the ALU . these flags are read only , therefore they can only be tested .

- **Carry flag (CF)**

Set if there is 0 carry out or a barrow in for most significant bit of the result during the execution of an arithmetic instruction otherwise CF is reset .

- **Parity flag (PF)**

Set if the result produced by the instruction has even parity (even number of ones)

Otherwise it reset .

- **Auxiliary carry flag (AF)**

Set if there is a carry out from the low nibble to the high nibble or a barrow in from the high nibble into the low nibble of the lower byte in a 16- bit word , otherwise it reset .

- **Zero flag (ZF)**

Set if the result of an arithmetic or logic operation is zero , otherwise it reset .

- **Sign flag (SF)**

Set if the result is negative otherwise it reset .

- **Over flow flag (OF)**

Set if the signed result out of range otherwise it reset .

2-Control flags

These flags are set and reset by program instruction to alter processing operation .

- **Trap flag (TF)**

When set the 8086 MP goes into single step mode that is useful for debugging programs .

- **Interrupt flag (IF)**

When set the 8086 MP recognize the interrupt requests at its INT input .

- **Direction flag**

Select either the increment or decrement mode for the DI end / or SI , during string instructions when set registers are automatically incremented when reset register are automatically decremented .