Int 0 ⇒

```
0 0 0 0     0 0 0 0
0 0 0 0     0 0 0 1
0 0 0 0     0 0 1 0
0 0 0 0     0 0 1 1
0-0-0-0-----0-0
```

0 → 0H - 3H
1 → 4H - 7H
2 → 8H - BH
3 → CH - FH
4 → 10H - 13H

Interrupt Vector

a. 0-4 are reserved vectors.

b. Some of the vectors are for errors that occur during the execution of software, such as the divide error interrupt.

c. Intel reserves the 5-31 interrupt vectors for the other microprocessor Products. The remaining interrupt vectors (32-255) are available for the user.

d. The lower the vector number, the higher the Priority.

e. Interrupt goes to the memory location that is four times the value of the interrupt number

Math → Calculate the memory address / location for the interrupt INT CH in the interrupt vector table.

Solve:

Given,

INT CH

CH × 4H = 30H

∴ 0090H & 0031H Location contains IP in the interrupt vector table.

ii. 0032H & 0033H Location contains CS in the interrupt vector table

Address	
33H	CS-H
32H	CS-L
31H	IP-H
30H	IP-L

Fig: Memory Address / Location for the interrupt INT CH

* 4 পরিমান gape -এর জন্য 4H দিয়ে গুন করছি। তারপর 4 বার পরিমান shift করি।

* Physical Address ⇒ Interrupt এর first line indicate করে।

Math → Calculate the memory address / location for the interrupt INT 5H in the interrupt vector table.

Ans:

Given

INT 5H

5H × 4H = 14H

17H	CS-H
16H	CS-L
15H	IP-H
14H	IP-L

Fig: Memory Address / Location for the interrupt INT 5H.

i. 0014H & 0015H Contains IP in the interrupt vector table

ii. 0016H & 0017H Location Contains CS in the interrupt vector table

* Interrupt Active হলে, নতুন CS, নতুন IP,

Main Program এর CS, IP stack এ save করা হয়,

নতুন CS, IP আসবে interrupt এ, তেমনি মুছে যাবে না, stack এ old value save করে রাখবে।

Micro-Processor দুটো Mode এ কাজ করে।

a. Real Mode b. Protective Mode.

Write differences between real mode vs Protective mode.

Ans:

Real Mode	Protected Mode
a. Supports Segmentation	a. Supports segmentation & paging
b. No virtual memory support.	b. Support virtual memory
c. Memory Protection mechanism is not available	c. Memory Protection mechanism is available.

Describe Operation of Real Mode Interrupt

Ans:

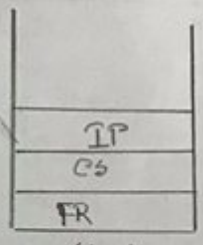
a. The Contents of the flag register are pushed onto the stack.

b. Both (IF) & (TF) flags are set to 0. This disables the INTR Pin & the Trap on Single step feature.

c. The Contents of the Current Code Segment register (CS) are Pushed onto the stack.

d. The Contents of the Current (IP) are Pushed onto the stack.

e. The interrupt vector Contents are fetched, & then Placed into both IP & CS So-that the next instruction executes at the interrupt Service Procedure addressed by the interrupt vector.



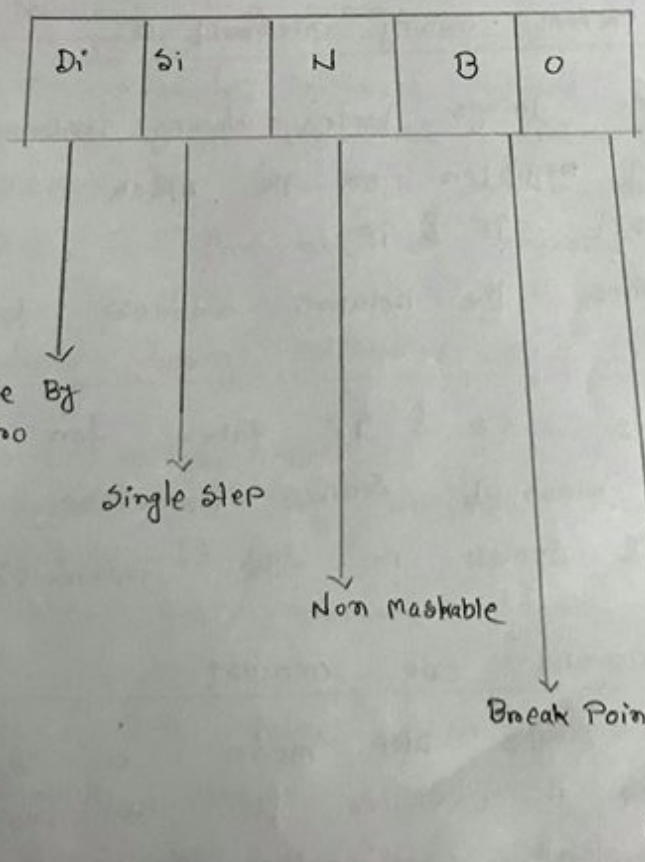
FR → Flag Register
CS → Code segment
IP → Instruction Pointer.

Stack এ Push করে

FR → CS → IP

Stack থেকে Pop করে

IP → CS → FR



Internupt Zero:

```
MOV  AX, 05
MOV  DX, 00
DIV  DX
```

When internupt zero occurs?

Ans:

The divide errnor occurs whenever the result from a division overflows or an attempt is made to divide by zero.

What happens during internupt 0.

Ans:

Three things happen during internupt 0.

a. Flag register on the stack.

b. Reset IF & TF

c. Pushes the return address (cs & IP) on stack.

d. Gets cs & IP value for the start of the internupt service Procedure from address 0008H & 0000H in the internupt vector table.

When internupt one occurs?

Ans:

In single step mode a system will stop after it executes its ~~ex~~ instruction & wait for further direction from the user.

Single-step or trap occurs after the execution of each instruction if the trap (TF) flag bit is set.

Q What happens during interrupt one.

Ans:

Three things happen.

a. Pushes the flag register on the stack.
b. Reset IF & TF
c. Pushes the return address (CS & IP) on stack.

Gets CS & IP value for the start of the interrupt service procedure from address 0006H & 0004H in the interrupt vector table

Q When interrupt 2 occurs.

Ans:

The non-maskable interrupt occurs when a logic 1 is placed on the NMI input Pin to the microprocessor. The input is non-maskable which means that it can not be disabled.

Q What happens during interrupt two.

Ans:

Three things happen

a. Pushes the flag register on the stack.
b. Reset IF & TF.
c. Pushes the return address (CS & IP) on stack.

Get CS & IP value for the start of the interrupt service procedure from address 000AH & 0008H in the interrupt vector table

Write an example of NMI interrupt.

Ans:

Suppose we have a Pressure sensor on a large system boiler connected to the NMI input. If the Pressure goes above some Preset limit, the sensor will send an interrupt signal to the 8086. Type-2 interrupt service Procedure for this case might turn off the fuel of the boiler, open a Pressure relief valve & sound an alarm.

What's the use of interrupt type 3.

Ans:

The main use of interrupt 3 is to implement a breakpoint function in a system for debugging.

*When inserted a breakpoint, the break Point features executes all the instructions up to the inserted breakpoint & then stop execution.

* INT 3 ; 1 byte instruction.

1.
2.
3.
4.
5.
6.
7. Mov int 3 AX, BX

int 3 => debugging

1 থেকে 6 পর্যন্ত line গুলো execute করবে, 7 নাম্বার line -এ- breakPoint set. তার আগে, wait করবে।

MOV
ADD
SUB
] ⟶ OPPCode

What happens during interrupt 3.

Ans.

Three things happen

a. Pushes the flag register on the stack
b. Reset IF & TF.
c. Pushes the return address (CS & IP) on stack.

Get the CS value for the start of the interrupt service Procedure from address 000EH in interrupt.

And IP value for the start of the Procedure from the address 000CH in the interrupt vector table

Interrupt:

INTo [Interrupt If Overflow]

```
1. Mov  AL, 80H
2. ADD  AL, 1H
3. INTo;
4. JMP 7;
5. SUB  AX, CX
6.
7. Mov  AX, BX
8.
```

```
INTo
if (OF == 1)
   JMP 7
else do nothing
```

// Overflow flag high হলে jump করবে।

Op Code → 2 byte করে।

* A special one byte instruction (INT 3) that uses this vector to access its interrupt service Procedure.

* Int 3 => halt করে wait করে।

Q) When interrupt-4 occurs.?

Ans: The 8086 overflow flag (OF) will be set if the sign result of an arithmetic operation is too Large to be represented in the destination register or memory location.

Q: What happens during interrupt ?

Ans:

Three things happen

a. Pushes the flag register on the stack
b. Reset IF & TF.
c. Pushes the return address (CS & IP) on stack

Get the CS & IP value for the start of the interrupt service Procedure from address 0012H & 0010H in the interrupt vector table.

INT n

INT nH

n = interrupt number [0 ~ 255]

The int n instruction calls the interrupt service Procedure that begins at the address represented in vector number n.

INTO :

INTO instruction overflow flag check করে, OF = 1 হলে into instruction Procedure call করে। Procedure এর address interrupt vector type number এ save করে।

* INT3 Software debuging এ লাগে।

IRET:

The interrupt service instruction (IRET) is used only with software or hardware interrupt service Procedure.

Write the work of IRET.

Ans.

IRET does three things.

a. Pop stack data back into the IP.

b. PoP stack data back into CS

C. Pop Stack data back into the flag register.

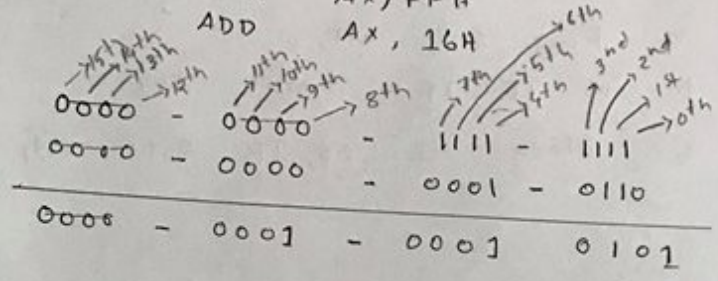
Give an example of Interrupt Service Procedure

Ans:

```
INTS    PROC    FAR    USES
        ADD     AX, BX
        ADD     AX, BP
        ADD     AX, DI
        ADD     AX, SI
        IRET
INTS    ENDP.
```

Q. Show statuses of Flags


```
        MOV   AX, FFFFH
        ADD   AX, 16H
```



ZF = 0 [The result is non zero]

CF = 0 [There is no carry at the MSB (15th bit)

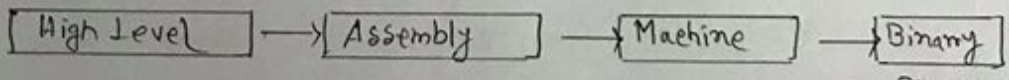
AF = 1 [There is carry from 3rd to 4th bit]

PF = 0 [Odd number of 1's, lower 8 bit]

SF = 0 [It's a Positive Number]

OF = 0 [It's with in -1d to -32768d & ~~at~~ 0d to 32767d. So no overflow]

=> 16 bit এর জন্য PF চেক করার সময় শেষ 8 bit এ 1 এর সংখ্যা চেক করবো,



Binary মানে hex code.

* IRET use করা হয় Return এর সময়।
* Interrupt হলে আমরা
  a. Flag save করি,
  b. ~~If~~ TF, IF disable করব।
  C. Stack এ CS, IP save করি।