8086 Addressing Modes

- The 8086 CPU can access data or operands in different ways.
- These different ways are called addressing modes
- Four main groups:-
    - Immediate Addressing
    - Register Addressing
    - Memory Addressing
    - I/O port Addressing

1. **Immediate Addressing**

   The source operand is an immediate value (a constant).

   e.g.

   MOV DX, 1234h

   MOV AL, 0

   Note: MOV BX, [1234h] ← not immediate mode!

2. **Register Addressing**

   The source operand is a register

   The destination may or may not be a register

   e.g.

   MOV AL, DL

   MOV SI, DI

   MOV ARRLEN, CL

…..next page …..

Memory Addressing

a) Direct Memory Addressing

e.g.

```
MOV CL, ARRLEN
MOV BX, DS:34H
```

b) Indirect Memory Addressing

i. Register Indirect addressing

- MOV [DI], 0D402H

Note: SI, DI or BX can be used. **Not BP**.

ii. Based Addressing with displacement

- MOV 2345H[BX], 0D402H
- MOV 45H[BP], 0D402H
- MOV [BX+85H], 0D402H

Note: BP or BX can be used as base pointers

iii. Indexed Addressing with displacement

- MOV 2345H[DI], 0D402H
- MOV [DI-80H], 0D402H
- MOV 45H[SI], 0D402H

Note: Si or Di can be used as Index Registers

iv. Based Indexed Addressing

- MOV [DI][BX], 0D402H
- MOV [DI+BP], 0D402H

Note: One Base register (BP or BX) and one Index register (SI or DI) is used

v. Based Indexed Addressing with displacement

- MOV 37H[DI][BX], 0D402H
- MOV [DI+BX+37H], 0D402H
- MOV [DI+BX+1234H],0D402H

Note: One Base register (BP or BX) ,one Index register (SI or DI) and an 8 bit or 16 bit displacement is used

3. I/O port Addressing

a) Fixed Port Addressing

e.g.

```
IN AL, 0Ah
OUT 0FEh, CX
```

b) Variable Port Addressing

e.g.

```
MOV DX, ABCDH
IN AL, DX

MOV DX, 5566h
OUT DX, AX
```

Exercise: Identify the addressing modes used in the following instructions:

1. **INC [1224H]**
2. **DEC [1224]**
3. **SUB [BP+2], 05**
4. **SUB -55[1234H], 6789H**
5. **MOV CX,DI**
6. **MOVSB**
7. **REP MOVSB**
8. **LEA DX, STR1**
9. **MOV DX, OFFSET STR1**
10. **INC [DI]**
11. **INC DI**
12. **MOV [BP+SI+90], AL**
13. **MOV 90[BP+SI],AL**