SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ITT204 - MICROCONTROLLER AND EMBEDDED SYSTEMS

II YEAR/ IV SEMESTER

UNIT I ARCHITECTURE OF 8086 MICROPROCESSOR

TOPIC – 8086 ADDRESSING MODES

- **The way of specifying data to be operated by an instruction is known as addressing modes. This specifies that the given data is an immediate data or an address. It also specifies whether the given operand is register or register pair. Types of addressing modes:**

- **Addressing modes help us to understand the types of operands and the way they are accessed while executing an instruction.**

OUTLINE

ADDRESSING MODES OF 8086

1) Immediate addressing mode
2) Register addressing mode
3) Direct memory addressing mode
4) Register based indirect addressing mode
5) Register relative addressing mode
6) Base indexed addressing mode
7) Relative based indexed addressing mode
8) Implied addressing mode

1) Immediate addressing mode-

- In this mode, the operand is specified in the instruction itself. Instructions are longer but the operands are easily identified.
- Example:
- MVI CL, 12H
- This instruction moves 12 immediately into CL register. CL ← 12H

2) Register addressing mode-

- In this mode, operands are specified using registers. This addressing mode is normally preferred because the instructions are compact and fastest executing of all instruction forms.
- Registers may be used as source operands, destination operands or both.
- Example:
- MOV AX, BX
- This instruction copies the contents of BX register into AX register. AX ← BX

3) Direct memory addressing mode

- In this mode, address of the operand is directly specified in the instruction. Here only the offset address is specified, the segment being indicated by the instruction.
- Example:
- MOV CL, [4321H]
- This instruction moves data from location 4321H in the data segment into CL.
- The physical address is calculated as
- DS * 10H + 4321
- Assume DS = 5000H
- ∴PA = 50000 + 4321 = 54321H
- ∴CL ← [54321H]

4) Register based indirect addressing mode

- In this mode, the effective address of the memory may be taken directly from one of the base register or index register specified by instruction. If register is SI, DI and BX then DS is by default segment register.
- If BP is used, then SS is by default segment register.
- Example:
- MOV CX, [BX]
- This instruction moves a word from the address pointed by BX and BX + 1 in data segment into CL and CH respectively.
- CL ← DS: [BX] and CH ← DS: [BX + 1]
- Physical address can be calculated as DS * 10H + BX.

5) Register relative addressing mode-

- In this mode, the operand address is calculated using one of the base registers and an 8 bit or a 16 bit displacement.
- Example:
- MOV CL, [BX + 04H]
- This instruction moves a byte from the address pointed by BX + 4 in data segment to CL.
- CL ← DS: [BX + 04H]
- Physical address can be calculated as DS * 10H + BX + 4H.

6) Base indexed addressing mode-

- Here, operand address is calculated as base register plus an index register.
- Example:
- MOV CL, [BX + SI]
- This instruction moves a byte from the address pointed by BX + SI in data segment to CL.
- CL ← DS: [BX + SI]
- Physical address can be calculated as DS * 10H + BX + SI.

7) Relative based indexed addressing mode

- In this mode, the address of the operand is calculated as the sum of base register, index register and 8 bit or 16 bit displacement.
- Example:
- MOV CL, [BX + DI + 20]
- This instruction moves a byte from the address pointed by BX + DI + 20H in data segment to CL.
- CL ← DS: [BX + DI + 20H]
- Physical address can be calculated as DS * 10H + BX + DI + 20H.

8) Implied addressing mode

- In this mode, the operands are implied and are hence not specified in the instruction.
- Example:
- STC
- This sets the carry flag.

1. **Register mode** – In this type of addressing mode both the operands are registers.
   Example:

```
MOV AX, BX
XOR AX, DX
ADD AL, BL
```

2. **Immediate mode** – In this type of addressing mode the source operand is a 8 bit or 16 bit data. Destination operand can never be immediate data. Example:

```
MOV AX, 2000
MOV CL, 0A
ADD AL, 45
AND AX, 0000
```

3. **Displacement or direct mode** – In this type of addressing mode the effective address is directly given in the instruction as displacement. Example:

```
MOV AX, [DISP]
MOV AX, [0500]
```

4. **Register indirect mode** – In this addressing mode the effective address is in SI, DI or BX. Example: Physical Address = Segment Address + Effective Address

```
MOV AX, [DI]
ADD AL, [BX]
MOV AX, [SI]
```

5. **Based indexed mode** – In this the effective address is sum of base register and index register.

```
Base register: BX, BP
Index register: SI, DI
```

6. **Indexed mode** – In this type of addressing mode the effective address is sum of index register and displacement. Example:

```
MOV AX, [SI+2000]
MOV AL, [DI+3000]
```

7. **Based mode** – In this the effective address is the sum of base register and displacement. Example:

```
MOV AL, [BP+ 0100]
```

8. **Based indexed displacement mode** – In this type of addressing mode the effective address is the sum of index register, base register and displacement. Example:

```
MOV AL, [SI+BP+2000]
```

9. **String mode** – This addressing mode is related to string instructions. In this the value of SI and DI are auto incremented and decremented depending upon the value of directional flag. Example:

```
MOVS B
MOVS W
```

10. **Input/Output mode** – This addressing mode is related with input output operations. Example:

```
IN A, 45
OUT A, 50
```

11. **Relative mode** – In this the effective address is calculated with reference to instruction pointer. Example:

```
JNZ 8 bit address
IP=IP+8 bit address
```

THANK YOU