8086 ADDRESSING MODES

Session Objectives

- To explain the various addressing modes of the 8086 Microprocessor.

Session Outcomes

- At the end of the session, students will be able to
  - Understand the various addressing mode of 8086 microprocessor.

Outline

- To discuss the
  - Addressing mode of 8086 Microprocessor
  - Examples of each addressing mode of 8086 Microprocessor

Definition of Addressing Mode

- The way in which specifying the data in the instruction is called as addressing mode.

Types of Addressing Modes

- Immediate Addressing Mode
- Register Addressing Mode
- Direct Addressing Mode
- Register Indirect Addressing Mode
- Index Addressing Mode
- Based Addressing Mode
- Based & Indexed Addressing Mode
- Based & Indexed with displacement Addressing mode
- Strings Addressing Mode

IMMEDIATE ADDRESSING MODE

- The data required to transfer to any register is available with in the instruction.
- The data is within the instruction need not search anywhere
- Ex: MOV AX, 200AH

  After Executing this instruction

  AL=0AH, AH=20H

  ie AX=200AH

REGISTER ADDRESSING MODE

- In register addressing mode, an 8-bit or 16-bit data is specified as content of register

- Ex: MOV AL, BLH, MOV AX, BXH

DIRECT ADDRESSING MODE

- The data is placed in the memory. The Memory address is specified with in the instruction

Example : MOV AX, [2000H]

- But the memory address is not index or pointer register

REGISTER INDIRECT ADDRESSING MODE

- Address of the data is content of the register.

EX: MOV AX, [BX] ;

AL = [SI] ; AH=[SI+1]

JMP [DI] ; IP= [DI+1: DI]

INC BYTE PTR [BP] ; [BP] ← [BP]+1

DEC WORD PTR [BX] ;

[BX+1:BX] ← [BX+1:BX]-1

Indexed Addressing Mode

Main components are

- Data's address is the sum of index register and displacement
- Example

  MOV AX,[SI]+1

  JMP [BX]+1

Based Addressing Mode

- Memory address is the sum of the BX or BP base register plus a displacement specified within the instruction
- Ex:

MOV AX,[BP+1]; AL ⟵ [BP+1];

AH ⟵ [BP+2]

JMP [BX+1]; IP ⟵ [BX+3:BX+2]

BASED & INDEX ADDRESSING MODE

Memory address is the addition of the index register and base register.

Ex:

MOV AX,[BX+SI]; AL ⟵ [BX+SI] ;
AH ⟵ [BX+SI+1]

JMP [BX+DI] ; IP [BX+DI]

INC BP ; BP ⟵ BP+1

DEC BP ; BP ⟵ BP - 1

BASED & INDEXED WITH DISPLACEMENT ADDRESSING MODE

- Memory address is the of an index register , base register and displacement within instruction
- MOV AX,[BX+SI+6]; AL = [BX+SI+6] ;
  AH = [BX+SI+7]
- JMP [BX+DI+6] ; IP = [BX+DI+7 : BX+DI+6]
- INC BYTE PTR [BP+SI+5] ;
- DEC WORD PTR[BP+DI+5] ;

Strings Addressing Mode

- The memory source address is a register SI in the data segment, and the memory destination address is register DI in the extra segment.
  - Ex: MOVSB [ES:DI] ⟵ [DS:SI]

- If DF=0 SI SI+1 , DI ⟵ DI + 1
  DF=1 SI SI-1 , DI ⟵ DI - 1

Summary

- The various types of addressing modes of 8086 were studied.

Test Your Undestand

- What is the destination operand in the following instruction? How large is this operand?

  MOV CH, AH

- Find the which addressing mode is present in the following instruction?

  MOV CX, 1234

- Mention the instructions used for IO System communication with 8086 processor.

References

- Yu-Cheng Liu, Glenn A. Gibson, “Microcomputer Systems: The 8086 / 8088 Family -Architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2007.
- Doughlas V. Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH, 2012.

Thank you