ADDRESSING MODES OF 8051

There are five ways of addressing operands.

1. Register addressing
2. Direct addressing
3. Register- Indirect addressing
4. Immediate addressing
5. Indexed addressing

REGISTER ADDRESSING MODE

If the operand is specified in register it is called register addressing mode. It permits access to eight registers (R0- R7) of the register bank. There are four banks of eight registers.one of the four register bank is selected by a 2 bit field in the program status word (PSW). Other registers are A, B, AB and DPTR.

For example

MOV A, Rn

(A) $\leftarrow$ (Rn)

Move the contents of Rn into Accumulator.

DIRECT ADDRESSING MODE

In direct addressing mode, the address of the operand is specified in the instruction. Direct addressing has operands as byte or bit. Direct addressing of byte provides operation on one of the following.

1. Lower 128 bytes of internal data RAM.
2. Special Function Registers.

Direct bit addressing provides operation on the following.

1. RAM locations 00 - $1F_H$ are assigned to the register banks and stack.
2. RAM locations 20 - $2F_H$ are assigned for bit-addressable space .
3. RAM locations 30 - 7FH are available for byte-sized data.

Although the entire 128 bytes of RAM can be accessed using direct addressing mode, it is most often used to access RAM locations 30 - 7FH. This is due to the fact that register bank locations are accessed by the register names of R0- R7, but there is no such name for other RAM locations.

MOV R0,40_H ;move content of RAM location 40_H in R0

RAM locations 0 to 7 are allocated to bank 0 registers R0- R7. These registers can be accessed in two ways.

```
MOV  A, 04          ; is same as
MOV  A, R4          ; copy R4 into A
```

REGISTER INDIRECT ADDRESSING MODE

If the address of the operand is specified in register it is called register indirect addressing mode.

The registers R0 and R1 are used for this purpose .ie, R2- R7 cannot be used to hold the address of an operand located in RAM. When R0 and R1 are used to hold the address of the RAM location, they must be proceeded by @ sign.

Example

```
MOV  A, @R0     ; move contents of RAM whose address is held by R0 into A
MOV  @R1, B     ; move contents of B into RAM location whose address is
                  held by R1
```

IMMEDIATE ADDRESSING MODES

In this addressing mode, the operand on which the operation has to be performed is specified in the

```
MOV     A, #25H             ; load 25H into A
MOV     DPTR,#2550H  is same as,
MOV     DPL, #50H
MOV     DPH, #25H
```

INDEXED ADDRESSING MODE AND ON-CHIP ROM ACCESS

This is an indirect instruction used to access the program memory . in this instruction the operand on which the operation is to be performed is not specified directly. The data pointer or PC register may act as the base register and register A act as index register. Thus the base register (DPTR or PC) and index register A are added to get the memory location.

For example,

```
MOVC A,@A+DPTR
(A) ⟵ ( (A) + (DPTR))
```