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**FACULTY OF ENGINEERING & TECHNOLOGY**

**CSPS-106 Computer Organization**

**Lecture-15**

Mr. Dilip Kumar J Saini  
Assistant Professor  
Computer Science & Engineering

## ➤ ADDRESSING MODES

## ➤ TYPES OF ADDRESSING MODES



# ADDRESSING MODES

## Addressing Modes:

- \* Specifies a rule for interpreting or modifying the address field of the instruction (before the operand is actually referenced)

- \* Variety of addressing modes

- to give programming flexibility to the user
- to use the bits in the address field of the instruction efficiently



## Implied Mode

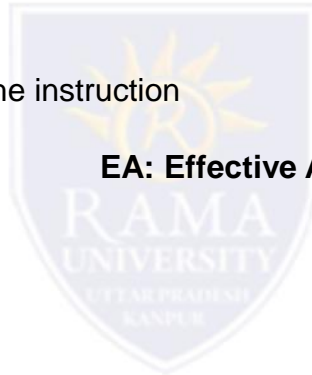
Address of the operands are specified implicitly

in the definition of the instruction

- No need to specify address in the instruction

- EA = AC, or EA = Stack[SP],

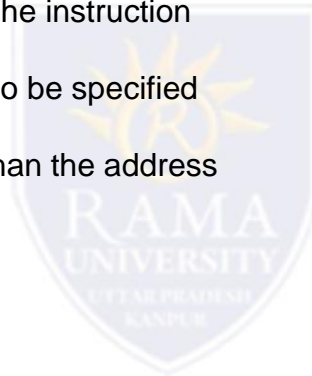
**EA: Effective Address.**



## Immediate Mode

Instead of specifying the address of the operand,  
operand itself is specified

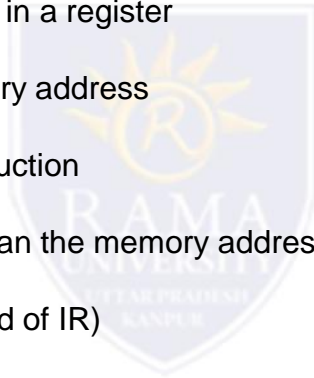
- No need to specify address in the instruction
- However, operand itself needs to be specified
- Sometimes, require more bits than the address
- Fast to acquire an operand



## Register Mode

Address specified in the instruction is the register address

- Designated operand need to be in a register
- Shorter address than the memory address
- Saving address field in the instruction
- Faster to acquire an operand than the memory addressing
- $EA = IR(R)$  (IR(R): Register field of IR)

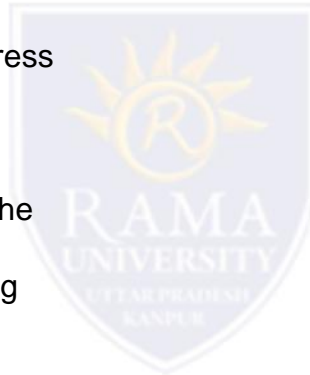


# TYPES OF ADDRESSING MODES

## Register Indirect Mode

Instruction specifies a register which contains  
the memory address of the operand

- Saving instruction bits since register address is shorter than the memory address
- Slower to acquire an operand than both the register addressing or memory addressing
- $EA = [IR(R)]$  ( $[x]$ : Content of  $x$ )



## Auto-increment or Auto-decrement features:

Same as the Register Indirect, but: When the address in the register is used to access memory, the value in the register is incremented or decremented by 1 (after or before the execution of the instruction)

# TYPES OF ADDRESSING MODES

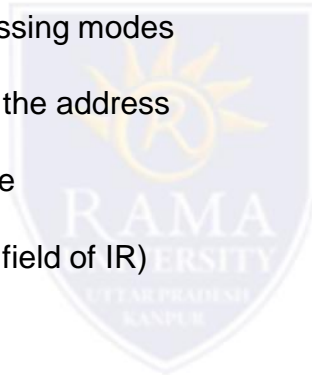
## Direct Address Mode

Instruction specifies the memory address which can be used directly to the physical memory

- Faster than the other memory addressing modes
- Too many bits are needed to specify the address

for a large physical memory space

- $EA = IR(\text{address})$ ,  $(IR(\text{address}))$ : address field of IR

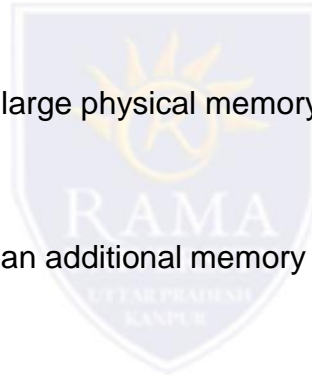




# TYPES OF ADDRESSING MODES

## Indirect Addressing Mode

- The address field of an instruction specifies the address of a memory location that contains the address of the operand
- - When the abbreviated address is used, large physical memory can be addressed with a relatively small number of bits
- - Slow to acquire an operand because of an additional memory access
- -  $EA = M[IR(\text{address})]$



# TYPES OF ADDRESSING MODES

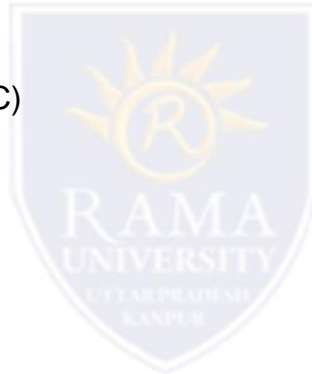
## Relative Addressing Modes

The Address fields of an instruction specifies the part of the address (abbreviated address) which can be used along with a designated register to calculate the address of the operand

PC Relative Addressing Mode( $R = PC$ )

-  $EA = PC + IR(\text{address})$

- Address field of the instruction is short
- Large physical memory can be accessed with a small number of address bits



# TYPES OF ADDRESSING MODES

## Indexed Addressing Mode

XR: Index Register:

$$- EA = XR + IR(\text{address})$$



## Base Register Addressing Mode

BAR: Base Address Register:

$$- EA = BAR + IR(\text{address})$$

# Multiple Choice Question

## MUTIPLE CHOICE QUESTIONS:

Sr no	Question	Option A	Option B	OptionC	OptionD
1	The assembler in first pass reads the program to collect symbols defined with offsets in a table	Hashtable	Symboltable	Both a&b	None ofthese
2	In given lines of code MOV AX,BL have different type of operands according to assembler for 8086 architecture these identifiers must beof:	Different type only inbyte	Same type either in word orbyte	Both a &b	None ofthese
3	What type of errors are not detected by assemblers:	Syntaxerror	Run timeerror	Logicalerror	All ofthese
4	_____ serves as the purpose of documentation only:	List	object	link	code
5	An assembler is a utility program that performs	Isometrictransla tion	Isomorphicttransla tion	Isochoricttranslati on	None ofthese

# REFERENCES

- <http://www.engppt.com/search/label/Computer%20Organization%20and%20Architecture>
- <http://www.engppt.com/search/label/Computer%20Architecture%20ppt>

