CSE-3103: Microprocessor and Microcontroller

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Memory Segmentation of 8086

Base address of segment →
= segment address × 10H,
segment starting address.
00000H, **0001**0H or **0002**0H, etc.

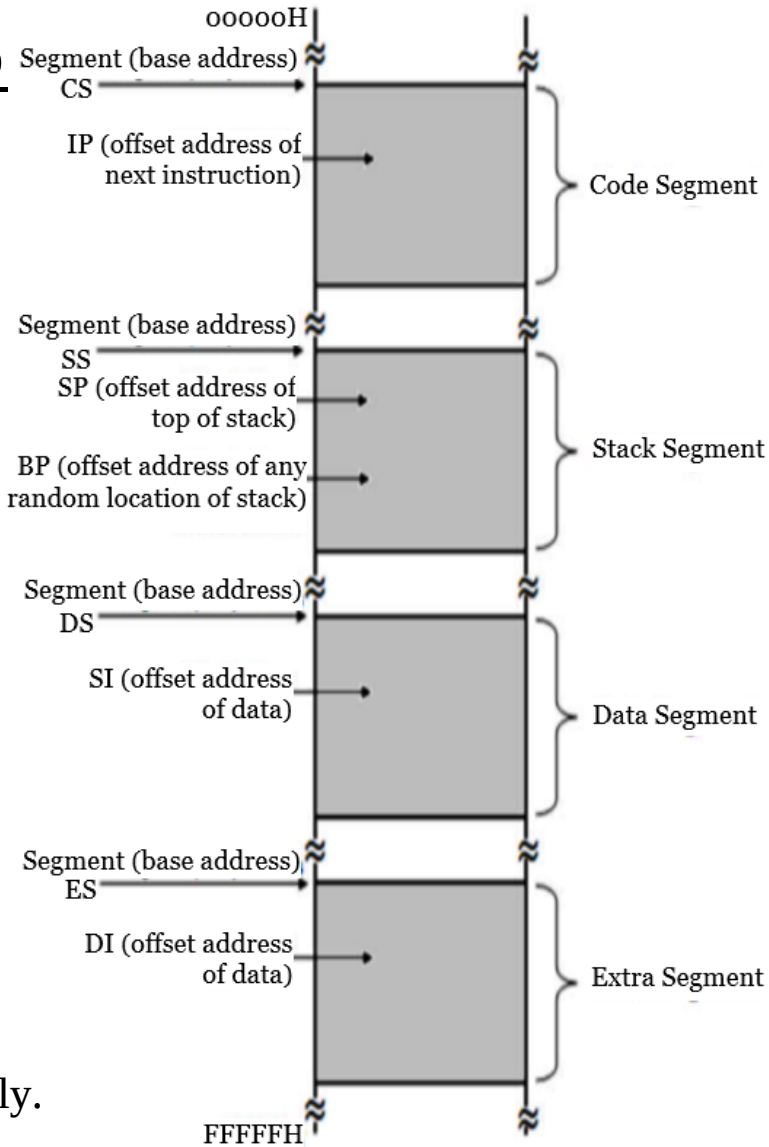
Offset address range = 0000H to FFFFH [2^{16} = 64 kB]

Advantages of memory segmentation →
address bus = 20 bits,
segmentation allows to work with 16-bit registers.

> 1 code, data, extra, stack segment can be used.
code, data, stack, extra segment > 64 kB long.

time-shared multitasking environment →
moves over from one user's program to another =
CPU reload four segment registers.

user's program (code) and data can be stored separately.



Logical Address, Base Segment Address and Physical Address

Segment address →

16-bit, reside in segment registers (CS, DS, ES, SS).

Base address →

20-bit, Segment address × 10H

Offset address →

= Effective address,

16-bit, reside in IP, BP, SP, BX, SI, DI.

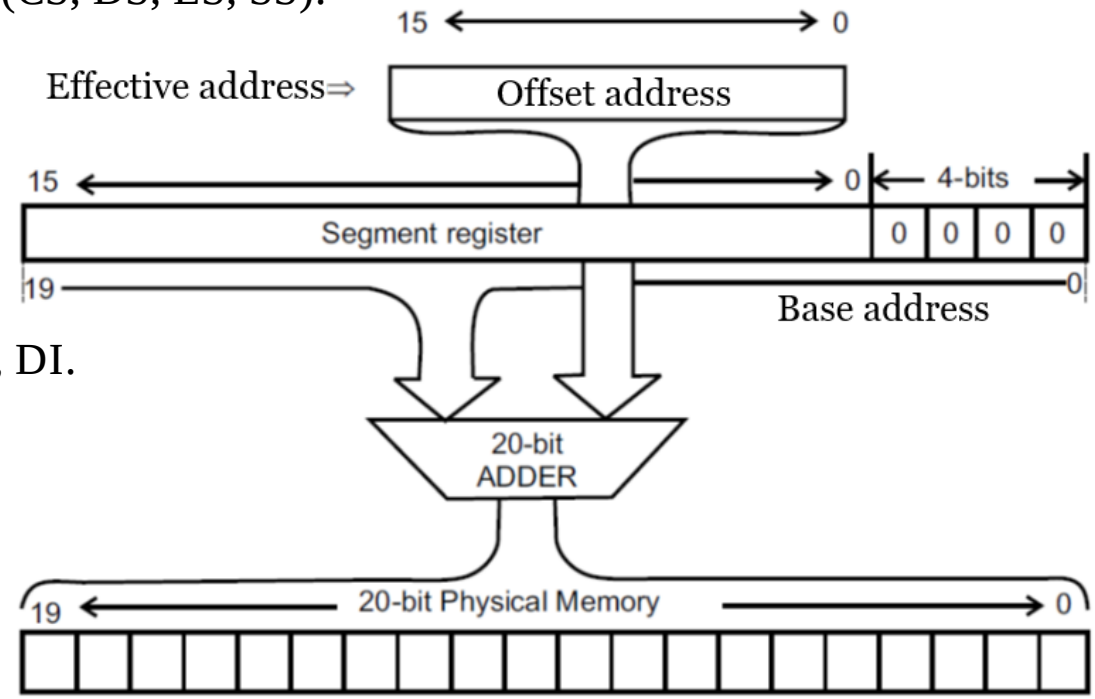
Logical address →

Segment : Offset = DS : 1234H

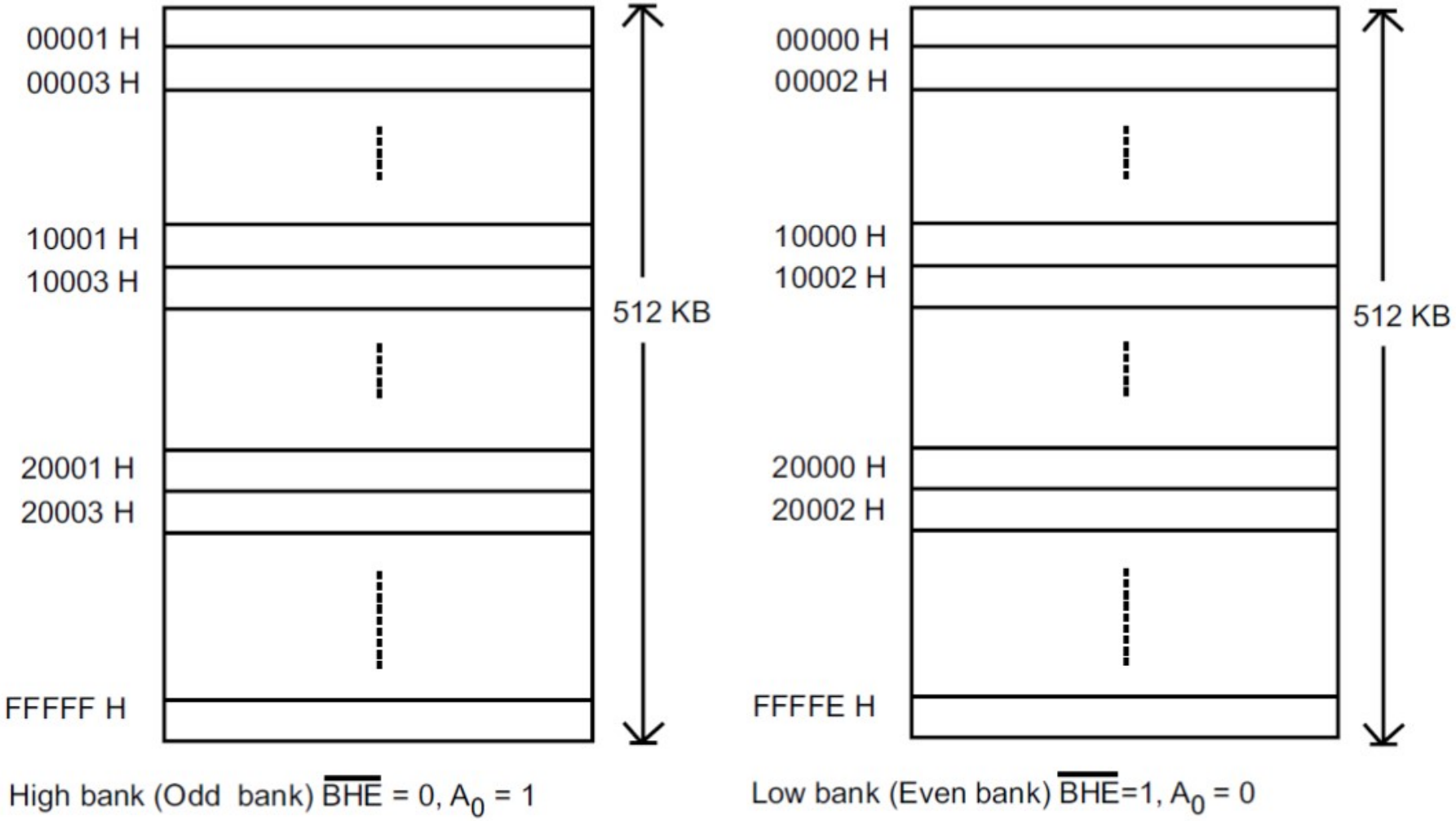
Physical address →

= Real address,

= Segment address × 10H + Offset address



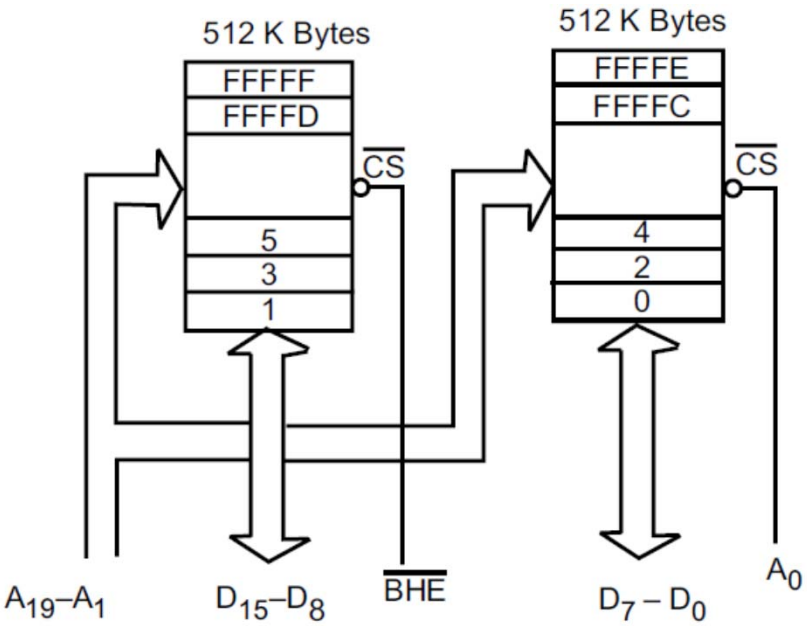
Memory Organization



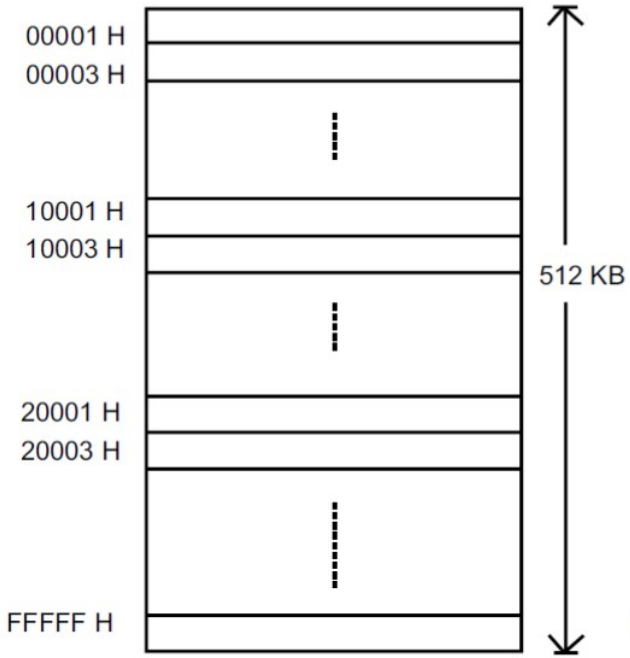
High bank (Odd bank) $\overline{BHE}$ = 0, A_0 = 1

Low bank (Even bank) $\overline{BHE}$=1, A_0 = 0

Memory Organization



$\overline{BHE}$	A_0	Word/byte access
0	0	Both banks active
0	1	Only high bank active
1	0	Only low bank active
1	1	No bank active



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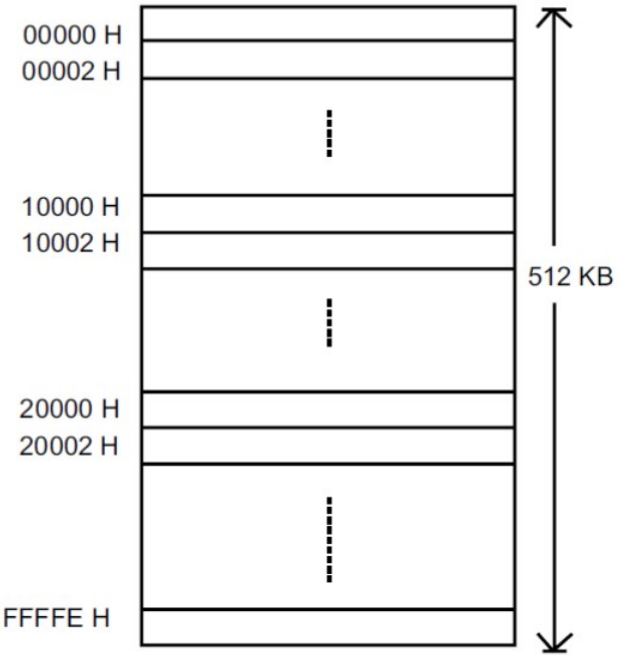

Low bank (Even bank) $\overline{BHE}$=1, A_0 = 0

Byte and Word Transfer by 8086

(a) even-addressed byte transfer,
(b) odd-addressed byte transfer,
(c) even-addressed word transfer,
(d) odd-addressed word transfer.

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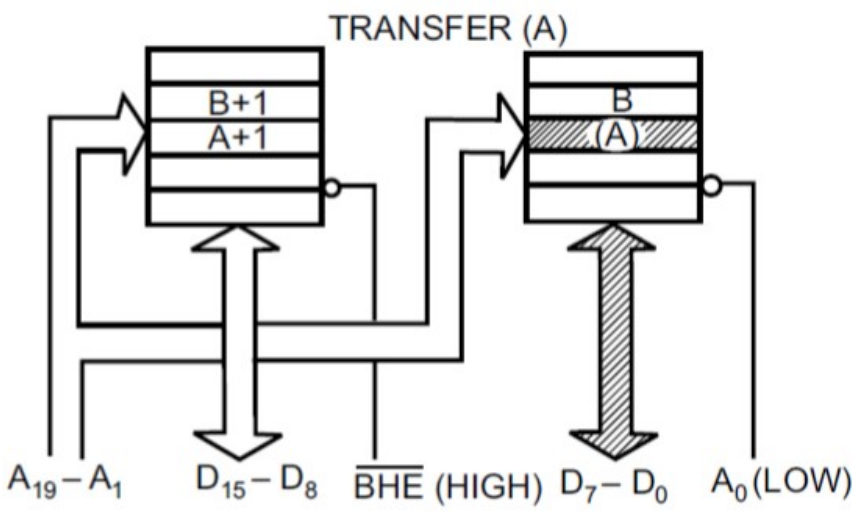
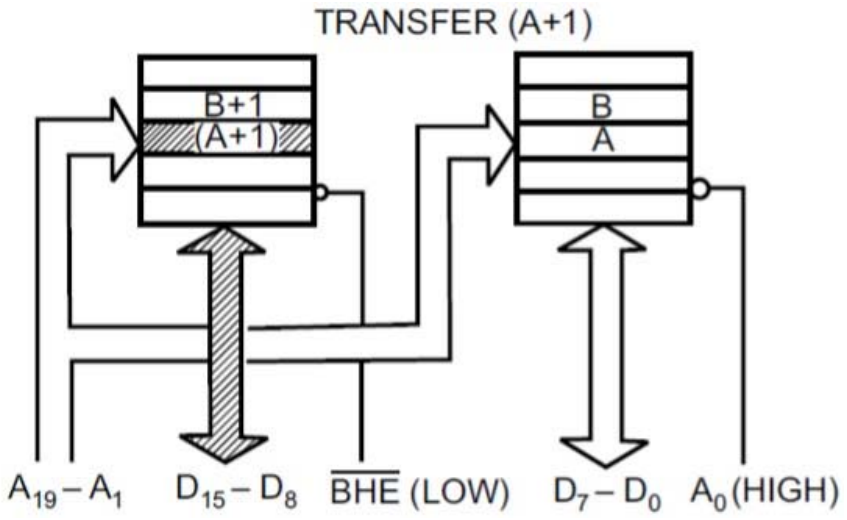
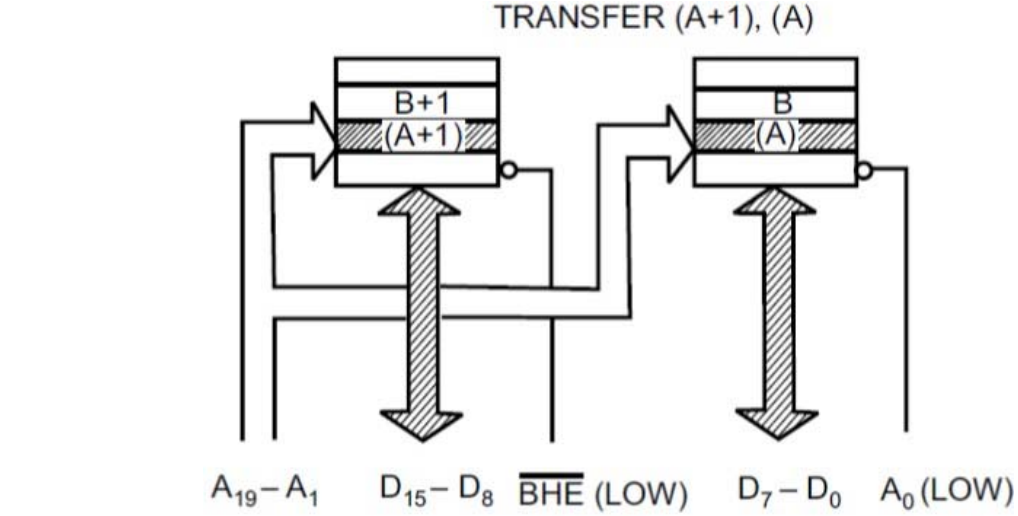




Byte and Word Transfer by 8086



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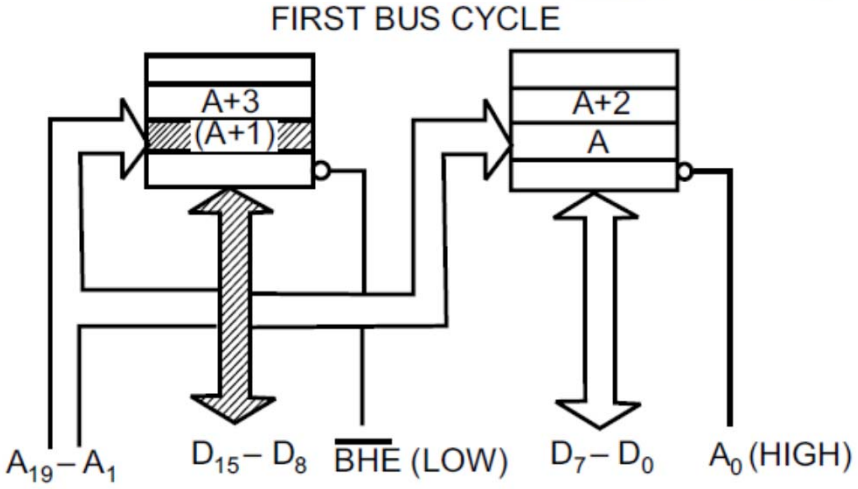

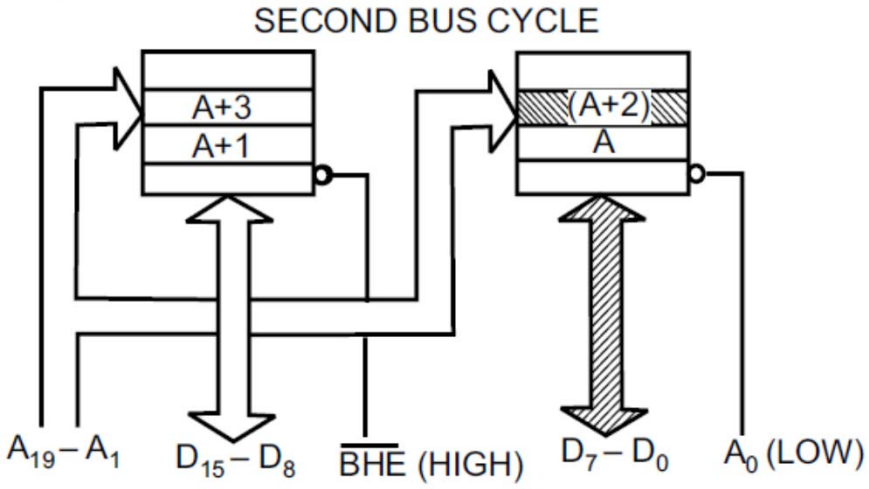

Addressing Modes

Instruction = opcode + operand.
Operand may reside in

(i) accumulator or
(ii) general purpose register or
(ii) memory location.

Addressing mode = manner in which operand is specified in instruction.
Different addressing modes of 8086 →

(i) Immediate operand addressing.
(ii) Register operand addressing.
(iii) Memory operand addressing.

Different memory addressing modes →

(i) Direct Addressing,
(ii) Register Indirect Addressing,
(iii) Based Addressing,
(iv) Indexed Addressing,
(v) Based Indexed Addressing,
(vi) Relative Based Indexed Addressing.