23VLS1401: Microcontroller and Computer architecture

Lecture 5 (U2)

Logical instructions and programming for Microprocessor 8085

A presentation by

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Session objectives

- To learn various software instructions related to the Logical operations for 8085 Microprocessor
- To learn various addressing modes related to the process of Logical operations
- To develop the programming technique in assembly language for given problem statement in which Logical operations are involved, store the source data, execute the program and observe the result.

Logical instructions

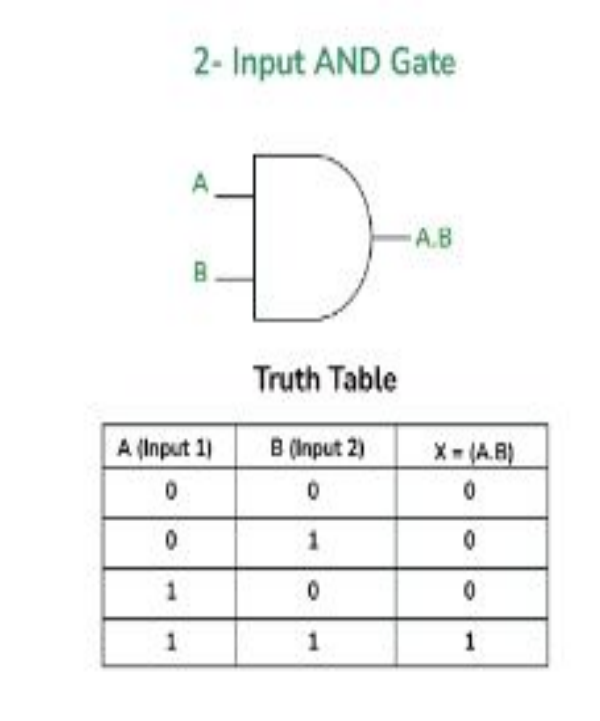
- ANA
- ANI
- XRA
- XRI
- ORA
- ORI
- CMA
- CMP
- CPI
- RRC
- RLC
- RAR
- RAL
- STC
- CMC

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
ANA	R M	Logically AND the 8 bit source R/M with accumulator	This instruction ANDs the contents of the source register/ memory location with Accumulator and result is placed in the accumulator and Flags are modified.	Register addressing mode

- M specifies a memory location whose address is specified by the HL pair
- R specifies Registers A, B, C,D,E, H and L
- Flags are modified

Example of ANA instruction: ANA B

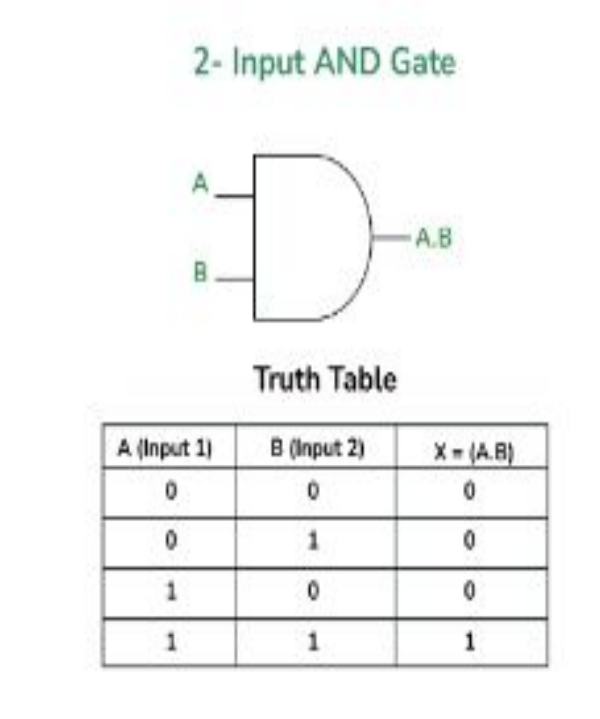


A	56	0	1	0	1	0	1	1	0
B	43	0	1	0	0	0	0	1	1
A.B	42	0	1	0	0	0	0	1	0

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
ANI	8 bit data	Logically AND the 8 bit data with accumulator	This instruction ANDs the 8-bit data with Accumulator and result is placed in the accumulator and Flags are modified.	Immediate addressing mode

Example of ANA instruction: ANI 7FH



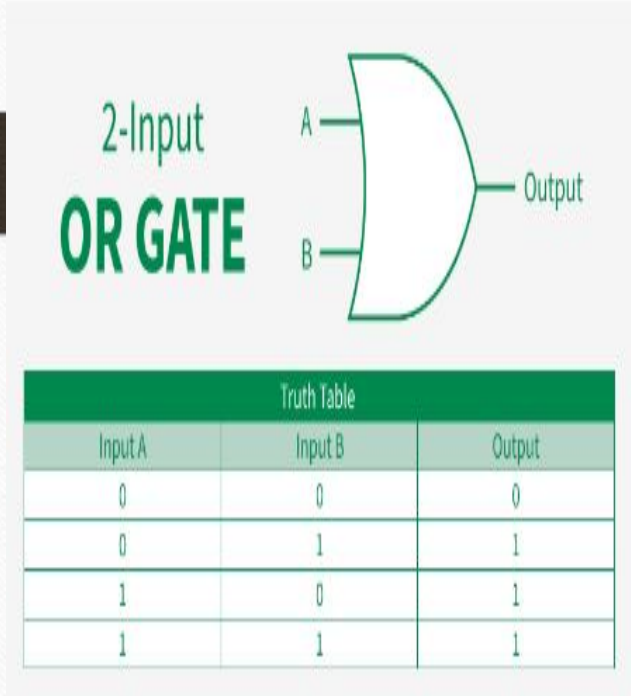
A	56	0	1	0	1	0	1	1	0
8 bit data	7F	0	1	1	1	1	1	1	1
A	56	0	1	0	1	0	1	1	0

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
ORA	R M	Logically OR the 8 bit source R/M with accumulator	This instruction logically ORs the contents of the source register/ memory location with Accumulator and result is placed in the accumulator and Flags are modified.	Register addressing mode

- M specifies a memory location whose address is specified by the HL pair
- R specifies Registers A, B, C,D,E, H and L
- Flags are modified

Example of ORA instruction: ORA B



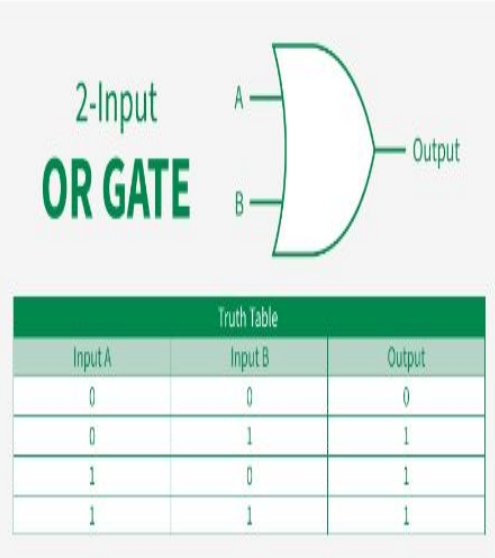
Truth Table		
Input A	Input B	Output
0	0	0
0	1	1
1	0	1
1	1	1

A	56	0	1	0	1	0	1	1	0
B	43	0	1	0	0	0	0	1	1
A+B	57	0	1	0	1	0	1	1	1

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
ORI	8 bit data	Logically OR the 8 bit data with accumulator	This instruction ORs the 8-bit data with Accumulator and result is placed in the accumulator and Flags are modified.	Immediate addressing mode

Example of ANA instruction: ORI 7FH



Truth Table		
Input A	Input B	Output
0	0	0
0	1	1
1	0	1
1	1	1

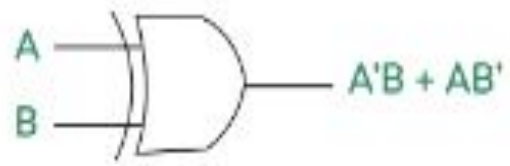
A	56	0	1	0	1	0	1	1	0
8 bit data	7F	0	1	1	1	1	1	1	1
A+8 bit data	7F	0	1	1	1	1	1	1	1

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
XRA	R M	Logically EXOR the 8 bit source R/M with accumulator	This instruction logically EXORs the contents of the source register/ memory location with Accumulator and result is placed in the accumulator and Flags are modified.	Register addressing mode

- M specifies a memory location whose address is specified by the HL pair
- R specifies Registers A, B, C,D,E, H and L
- Flags are modified

Example of XRA instruction: XRA B



Truth Table

A (Input 1)	B (Input 2)	X = A'B + AB'
0	0	0
0	1	1
1	0	1
1	1	0

A	56	0	1	0	1	0	1	1	0
B	43	0	1	0	0	0	0	1	1
A⊕B	15	0	0	0	1	0	1	0	1

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
XRI	8 bit data	Logically EXOR the 8 bit data with accumulator	This instruction EXORs the 8-bit data with Accumulator and result is placed in the accumulator and Flags are modified.	Immediate addressing mode

Example of ANA instruction: ORI 7FH

Truth Table

A (Input 1)	B (Input 2)	X = A'B + AB'
0	0	0
0	1	1
1	0	1
1	1	0

A	56	0	1	0	1	0	1	1	0
8 bit data	7F	0	1	1	1	1	1	1	1
A⊕8 bit data	29	0	0	1	0	1	0	0	1

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
CMA		Complement accumulator	This instruction complements Accumulator by replacing 1 by 0 and 0 by 1 and result is placed in the accumulator	Implicit addressing mode

Example of CMA instruction: CMA

A	56	0	1	0	1	0	1	1	0
A	A9	1	0	1	0	1	0	0	1

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
CMP	R M	Compare accumulator with R/M	This instruction Compares R/M with Accumulator. Contents of Accumulator and R/M are not changed. Only Flags are modified. A<R/M – Carry flag is set A>R/M – Carry flag is reset A=R/M – Zero flag is set	Register addressing mode

Example of CMP instruction: CMP B

A	56	0	1	0	1	0	1	1	0
B	7F	0	1	1	1	1	1	1	1

Carry flag	1

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
CPI	8 bit data	Compare accumulator with 8 bit data	This instruction Compares R/M with Accumulator. Contents of Accumulator and R/M are not changed. Only Flags are modified. A<8 bit data – Carry flag is set A>8 bit data – Carry flag is reset A=8 bit data – Zero flag is set	Immediate addressing mode

Example of CPI instruction: CPI 44H

A	56	0	1	0	1	0	1	1	0
8 bit data	44	0	1	0	0	0	1	0	0

Carry flag	0

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
CMC		Complement carry	This instruction complements the carry flag	Implicit addressing mode

Before CMC

Carry flag	0

After CMC

Carry flag	1

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
STC		Set carry	This instruction sets the carry flag	Implicit addressing mode

Before STC

Carry flag	0

After STC

Carry flag	1

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
RLC		Rotate accumulator Left	This instruction Rotates Accumulator left	Implicit addressing mode

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
RRC		Rotate accumulator Right	This instruction Rotates Accumulator Right	Implicit addressing mode

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
RAL		Rotate accumulator Left through carry flag	This instruction Rotates Accumulator left through carry flag	Implicit addressing mode

Logical instructions

Opcode	Operand	Meaning	Explanation	Addressing mode
RAR		Rotate accumulator Right through carry	This instruction Rotates Accumulator Right through carry	Implicit addressing mode

Example of ANA instruction: ORI 7FH

Truth Table

A (Input 1)	B (Input 2)	X = A'B + AB'
0	0	0
0	1	1
1	0	1
1	1	0

A	56	0	1	0	1	0	1	1	0
8 bit data	7F	0	1	1	1	1	1	1	1
A⊕8 bit data	29	0	0	1	0	1	0	0	1

4. Five pairs of data bytes are stored in memory locations starting at 2501H. Write a program to add the data bytes in pairs and place the result in same memory locations, i.e. sum replacing the first data byte and carry replacing the second.


Thank
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