

Computer Architecture

Lecture 8

Logic Instructions

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Logic Instructions

(1)

ORA	R M	<ol style="list-style-type: none">1. Logical OR register or memory with accumulator2. The contents of the accumulator are logically ORed with the contents of the operand (register or memory), and the result is placed in the accumulator.3. If the operand is a memory location, its address is specified by the contents of HL registers.4. S, Z, P flags are modified to reflect the result of the operation.5. CY and AC are reset.6. Example: ORA 45_H
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Truth Table of OR instruction

X	Y	X OR Y
0	0	0
0	1	1
1	0	1
1	1	0

Logic Instructions

Example:

- Write program in 8085 to store $9D_H$ in memory location 5060_H use indirect method. Then ORed them with the data from input port $F1_H$ that represented by switch number 1 and 2 are on and other switches are off. Show what are the flags?.

Answer

- LXI H, 5060_H
- MVI M, $9D_H$
- IN $F1_H$
- ORA M

S	Z	AC	P	CY

Logic Instructions

(2)

ORI	8-bits data	<ol style="list-style-type: none">1. Logical OR immediate with accumulator2. The contents of the accumulator are logically ORed with the 8-bit data (operand) and the result is placed in the accumulator.3. S, Z, P flags are modified to reflect the result of the operation.4. CY and AC are reset.5. Example: ORI 55_H
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Logic Instructions

Example:

- Write program in 8085 to load $9D_H$ from memory location 5060_H use indirect method. Then ORed immediate the data with register C that hold $F0$. Explain which switches on port 00_H are turn off?

Answer

- LXI H, 5060_H
- MOV A, M
- ORI C
- OUT 00

Logic Instructions

(3)

ANA	R M	<ol style="list-style-type: none">1. Logical AND register or memory with accumulator2. The contents of the accumulator are logically ANDed with the contents of the operand (register or memory), and the result is placed in the accumulator.3. If the operand is a memory location, its address is specified by the contents of HL registers.4. S, Z, P flags are modified to reflect the result of the operation.5. CY is reset. AC is set.6. Example: ANA 63_H
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Truth Table of AND instruction

X	Y	X AND Y
0	0	0
0	1	0
1	0	0
1	1	1

Logic Instructions

Example:

- Write program in 8085 to store the Values (55, 65, 75, 85, 95) in memory locations (5000, 5001, 5002, 5003, 5004)_H respectively use indirect method. Then ANDed these data and store the result in memory location 5005_H?

Answer

LXI H, 5000 _H	INX H	DCX H	DCX H
MVI M, 55 _H	MVI M, 85 _H	ANA M	ANA M
INX H	INX H		
MVI M, 65 _H	MVI M, 95 _H	DCX H	DCX H
INX H		ANA M	ANA M
MVI M, 75 _H	MOV A,M		
			STA 5005 _H

Logic Instructions

(4)

ANI	8-bits data	<ol style="list-style-type: none">1. Logical AND immediate with accumulator2. The contents of the accumulator are logically ANDed with the 8-bit data (operand) and the result is placed in the accumulator.3. S, Z, P flags are modified to reflect the result of the operation.4. CY is reset. AC is set.5. Example: ANI 8D_H
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Example:

- *Write program in 8085 ANDed immediate the value of register C with value of register H, if register C has 78 while register H holds 22. What are the values of flags.*

Answer

- *MOVA, C*
- *ANI H*

Logic Instructions

(5)

XRA	R M	<ol style="list-style-type: none">1. Exclusive OR register or memory with accumulator2. The contents of the accumulator are Exclusive ORed with the contents of the operand (register or memory), and the result is placed in the accumulator.3. If the operand is a memory location, its address is specified by the contents of HL registers.4. S, Z, P flags are modified to reflect the result of the operation.5. CY and AC are reset.6. Example: XRA 55_H
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Truth Table of AND instruction

X	Y	X XRA Y
0	0	0
0	1	1
1	0	1
1	1	0

Logic Instructions

Example:

- Write program in 8085 to clear the Accumulator if it has $B3_H$. Add the content of memory location $30FF_H$ with register L. Show the result on port 50_H

Answer

- XRA A
- LDA $30FF_H$
- ADD L
- OUT 50_H

Logic Instructions

(6)

XRI	8-bits data	<ol style="list-style-type: none">1. Exclusive OR immediate with accumulator2. The contents of the accumulator are Exclusive ORed with the 8-bit data (operand) and the result is placed in the accumulator.3. S, Z, P flags are modified to reflect the result of the operation.4. CY and AC are reset.5. Example: XRI 63_H
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Logic Instructions

Example:

- Write program in 8085 to clear the Accumulator if it has $B3_H$.
XRed Immediate the content of memory location $30FF_H$ that has 33_H with 77_H . Show which switch on port $50H$ is turn on.

Answer

- XRA A
- LDA $30FF_H$
- XRI 77_H
- OUT 55_H

Logic Instructions

(7) RRC

RRC

1. Rotate accumulator right
2. Each binary bit of the accumulator is rotated right by one position.
3. Bit D0 is placed in the position of D7 as well as in the Carry flag.
4. CY is modified according to bit D0. S, Z, P, AC are not affected.
5. Example: RRC

Logic Instructions

Example

- Store the data 55_H in memory location 3001 and the register B with 37_H. Add these data then rotate the result right.

Answer

- MVI A, 55_H
- STA 3001
- MVI B, 37
- LDA 3001
- ADD B

Logic Instructions

		1	1	1		1	1	1	
A	=	0	1	0	1	0	1	0	1
B	=	0	0	1	1	0	1	1	1
Result A =		1	0	0	0	1	1	0	0

Flags

S	Z			AC		p		CY
1	0			0		1		0

RRC

Result after RRC

0	1	0	0	0	1	1	0
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Flags after RRC

S	Z			AC		p		CY
1	0			0		1		0

Logic Instructions

(8) RLC

RLC

1. Rotate accumulator left
2. Each binary bit of the accumulator is rotated left by one position.
3. Bit D7 is placed in the position of D0 as well as in the Carry flag.
4. CY is modified according to bit D0. S, Z, P, AC are not affected.
5. Example: RLC

Logic Instructions

Example

- Store the data FF_H in memory location 3001 and the register B with 87_H . Add these data then rotate the result Left.

Answer

- LXI H, 3001
- MVI M, FF_H
- MVI B, 87_H
- MOV B,A
- ADD M

Logic Instructions

	1	1	1	1	1	1	1	1	1
A	=	1	0	0	0	0	1	1	1
M	=	1	1	1	1	1	1	1	1
Result A =		1	0	0	0	0	1	1	0

Flags

S	Z			AC		p		CY
1	0			1		1		1

RLC

Result after RLC

0	0	0	0	1	1	0	1
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Flags after RLC

S	Z			AC		p		CY
1	0			1		1		1

Logic Instructions

(9) RAR

RAR

1. Rotate accumulator right through carry
2. Each binary bit of the accumulator is rotated right by one position through the Carry flag.
3. Bit D0 is placed in the Carry flag, and the Carry flag is placed in the most significant position D7.
4. CY is modified according to bit D0. S, Z, P, AC are not affected.
5. Example: RAR

Logic Instructions

Example

- Store the data FF_H in memory location 3001 and the register B with 87_H . Add these data then rotate the result Right with carry.

Answer

- LXI H, 3001
- MVI M, FF_H
- MVI B, 87_H
- MOV B,A
- ADD M

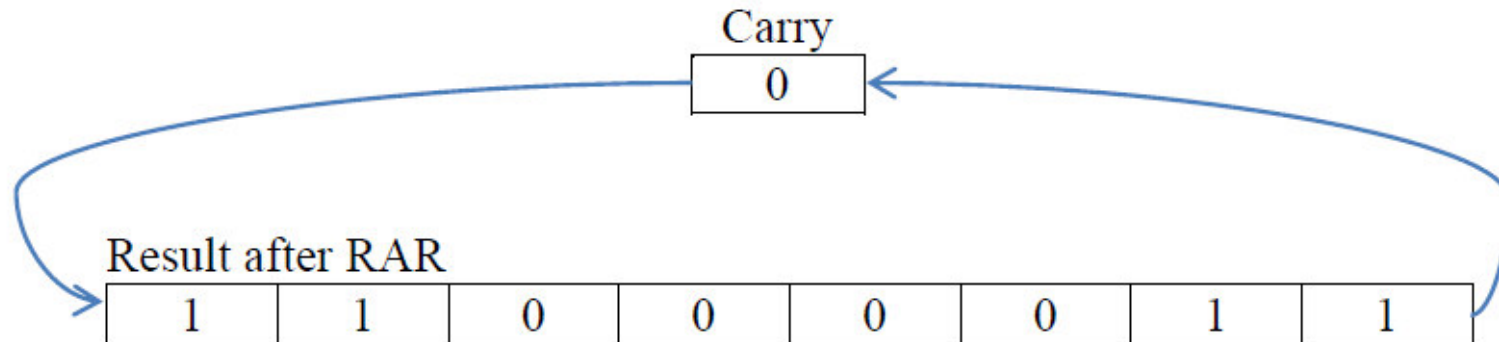
Logic Instructions

		1	1	1	1	1	1	1	1
A	=	1	0	0	0	0	1	1	1
M	=	1	1	1	1	1	1	1	1
Result A =		1	0	0	0	0	1	1	0

Flags

S	Z			AC		p		CY
1	0			1		1		1

RAR



Flags after RAR

S	Z			AC		p		CY
1	0			1		1		0

Logic Instructions

(10) RLR

RLR

1. Rotate accumulator right through carry
2. Each binary bit of the accumulator is rotated left by one position through the Carry flag.
3. Bit D7 is placed in the Carry flag, and the Carry flag is placed in the most significant position D0.
4. CY is modified according to bit D7. S, Z, P, AC are not affected.
5. Example: RLR

Logic Instructions

Example

- Store the data FF_H in memory location 3001 and the register B with 87_H . Add these data then rotate the result left with carry.

Answer

- LXI H, 3001
- MVI M, FF_H
- MVI B, 87_H
- MOV B,A
- ADD M

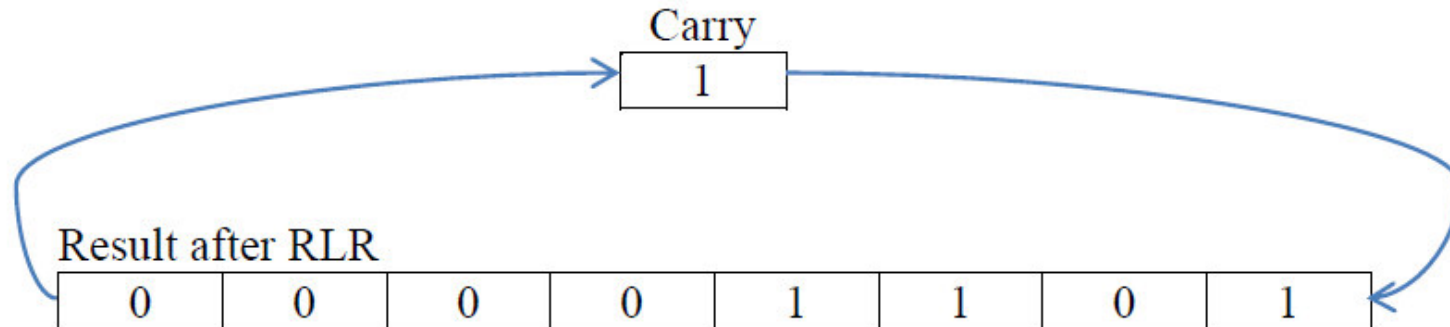
Logic Instructions

		1	1	1	1	1	1	1	1
A	=	1	0	0	0	0	1	1	1
M	=	1	1	1	1	1	1	1	1
Result A =		1	0	0	0	0	1	1	0

Flags

S	Z			AC		p		CY
1	0			1		1		1

RLR



Flags after RLR

S	Z			AC		p		CY
1	0			1		1		1

Logic Instructions

(11) CMA

CMA	<ol style="list-style-type: none">1. Complement accumulator2. The contents of the accumulator are complemented.3. No flags are affected.4. Example: CMA
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Example

- Store the data FFH in memory location 3001 and the register B with 87H. Add these data then complement the result.

Answer

- LXI H, 3001 MOV B,A
- MVI M, FFH ADD M
- MVI B, 87

Logic Instructions

	1	1	1	1	1	1	1	1	1
A	=	1	0	0	0	0	1	1	1
M	=	1	1	1	1	1	1	1	1
Result A =		1	0	0	0	0	1	1	0

Flags

S	Z			AC		p		CY
1	0			1		1		1

CMA

Result after CMA

0	1	1	1	1	0	0	1
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Flags after CMA

S	Z			AC		p		CY
1	0			1		1		1



The End