

Lecture – 9

LOGICAL OPERATIONS

These instructions perform various logical operations with the contents of the accumulator.

- **AND, OR, Exclusive-OR** — Any 8-bit number, or the contents of a register, or of a memory location can be logically ANDed, ORed, or Exclusive-ORed with the contents of the accumulator. The results are stored in the accumulator.
- **Rotate** — Each bit in the accumulator can be shifted either left or right to the next position.
- **Compare** — Any 8-bit number, or the contents of a register or of a memory location can be compared for equality, greater than, or less than, with the contents of the accumulator.
- **Complement** — The contents of the accumulator can be complemented; all 0s are replaced by 1s and all 1s are replaced by 0s.

INSTRUCTIONS

The logic instructions

1. Implicitly assume that the accumulator is one of the operands.
2. Reset (clear) the CY flag. The instruction CMA is an exception; it does not affect any flags.
3. Modify the Z, P, and S flags according to the data conditions of the result.
4. Place the result in the accumulator.
5. Do not affect the contents of the operand register.

Instruction	Description	Example
ANA R ANA M	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. If the operand is a memory location, its address is specified by the contents of HL registers. S, Z, P are modified to reflect the result of the operation. CY is reset. AC is set.	ANA B ANA M
ANI 8-bit data	The contents of the accumulator are logically ANDed with the 8-bit data (operand) and the result is placed in the accumulator. S, Z, P are modified to reflect the result of the operation. CY is reset. AC is set.	ANI 86H
ORA R ORA M	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. If the operand is a memory location, its address is specified by the contents of HL registers. S, Z, P are modified to reflect the result of the operation. CY and AC are reset.	ORA B ORA M

ORI 8-bit data	The contents of the accumulator are logically ORed with the 8-bit data (operand) and the result is placed in the accumulator. S, Z, P are modified to reflect the result of the operation. CY and AC are reset.	ORI 86H
XRA R XRA M	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. If the operand is a memory location, its address is specified by the contents of HL registers. S, Z, P are modified to reflect the result of the operation. CY and AC are reset.	XRA B XRA M
XRI 8-bit data	The contents of the accumulator are Exclusive ORed with the 8-bit data (operand) and the result is placed in the accumulator. S, Z, P are modified to reflect the result of the operation. CY and AC are reset.	XRI 86H
CMP R CMP M	The contents of the operand (register or memory) are compared with the contents of the accumulator. Both contents are preserved. The result of the comparison is shown by setting the flags of the PSW as follows: if (A) < (reg/mem): carry flag is set if (A) = (reg/mem): zero flag is set if (A) > (reg/mem): carry and zero flags are reset	CMP B CMP M
CPI 8-bit data	The second byte (8-bit data) is compared with the contents of the accumulator. The values being compared remain unchanged. The result of the comparison is shown by setting the flags of the PSW as follows: if (A) < data: carry flag is set if (A) = data: zero flag is set if (A) > data: carry and zero flags are reset	CPI 89H
RLC	Each binary bit of the accumulator is rotated left by one position. Bit D7 is placed in the position of D0 as well as in the Carry flag. CY is modified according to bit D7. S, Z, P, AC are not affected.	RLC
RRC	Each binary bit of the accumulator is rotated right by one position. Bit D0 is placed in the position of D7 as well as in the Carry flag. CY is modified according to bit D0. S, Z, P, AC are not affected.	RRC
RAL	Each binary bit of the accumulator is rotated left by one position through the Carry flag. Bit D7 is placed in the Carry flag, and the Carry flag is placed in the least significant position D0. CY is modified according to bit D7. S, Z, P, AC are not affected.	RAL
RAR	Each binary bit of the accumulator is rotated right by one position through the Carry flag. Bit D0 is placed in the Carry	RAR

	flag, and the Carry flag is placed in the most significant position D7. CY is modified according to bit D0. S, Z, P, AC are not affected.	
CMA	The contents of the accumulator are complemented. No flags are affected.	CMA
CMC	The Carry flag is complemented. No other flags are affected.	CMC
STC	The Carry flag is set to 1. No other flags are affected.	STC