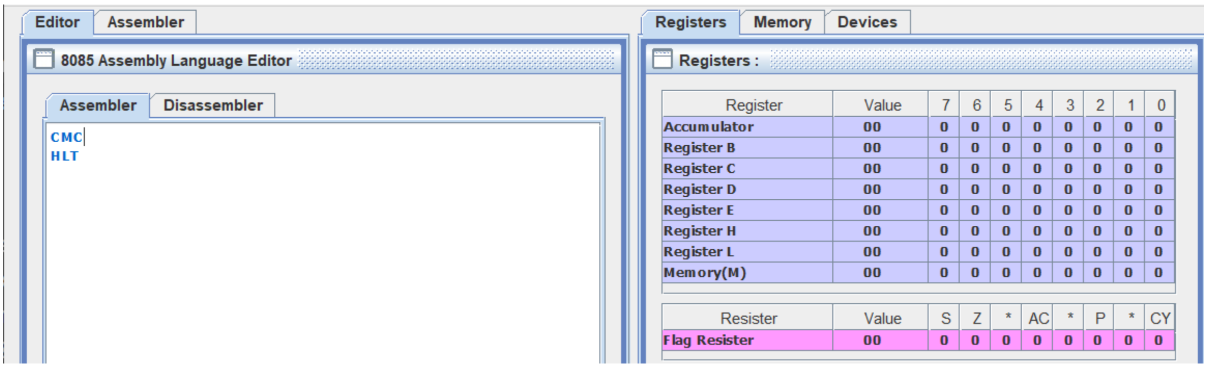
Lab 3

Aim :- TO EXPLORE AND ANALYZE LOGICAL INSTRUCTIONS AND BRANCH INSTRUCTIONS IN 8085.

Practice Assignment

1. Explore following logical instructions of 8085

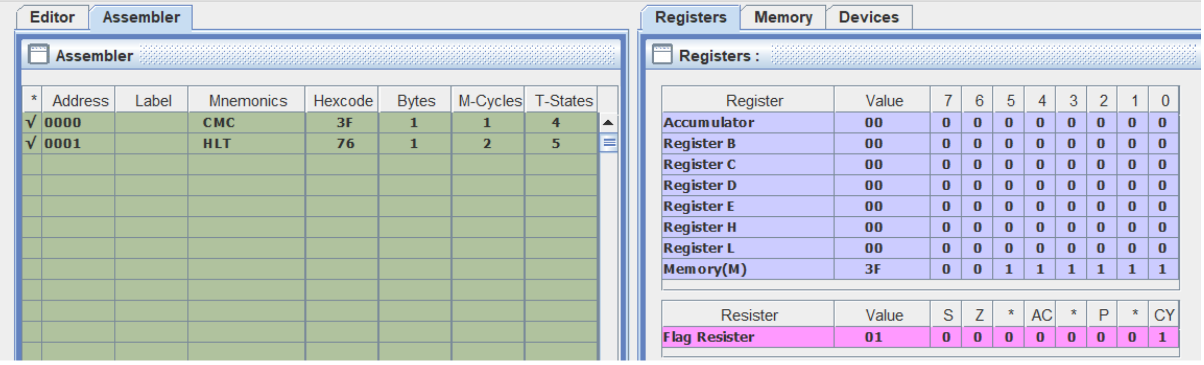
CMC

- Complement Carry
- Syntax: CMC
- Working : The CMC (Complement Carry) instruction in the 8085 microprocessor is used to complement (invert) the carry flag. If the carry flag is 1, the CMC instruction will change it to 0, and if the carry flag is 0, it will change it to 1. In simple terms, it toggles the carry flag.
- 

```
CMC
HLT
```

Register	Value	7	6	5	4	3	2	1	0
Accumulator	00	0	0	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	00	0	0	0	0	0	0	0	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	00	0	0	0	0	0	0	0	0

- 

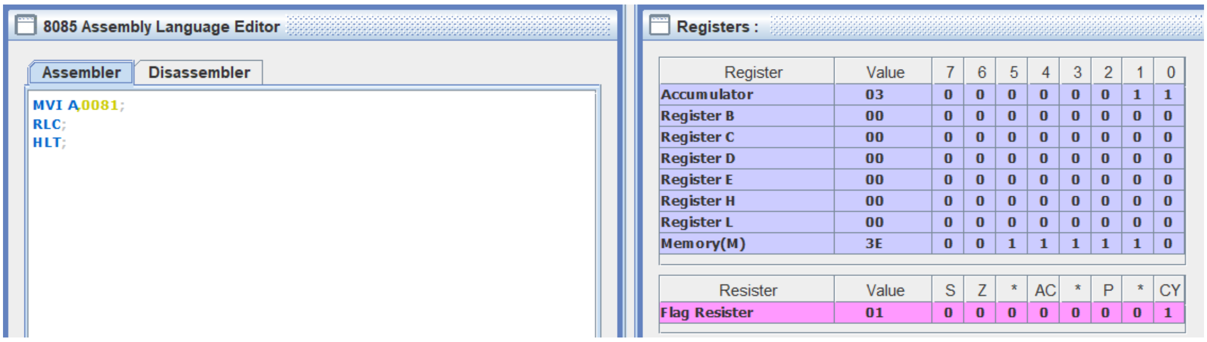
*	Address	Label	Mnemonics	Hexcode	Bytes	M-Cycles	T-States
√	0000		CMC	3F	1	1	4
√	0001		HLT	76	1	2	5

Register	Value	7	6	5	4	3	2	1	0
Accumulator	00	0	0	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	3F	0	0	1	1	1	1	1	1

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	01	0	0	0	0	0	0	0	1

RLC

- Rotate Accumulator Left
- Syntax: RLC
- Working: Each binary bit of the accumulator is rotated left by one position.

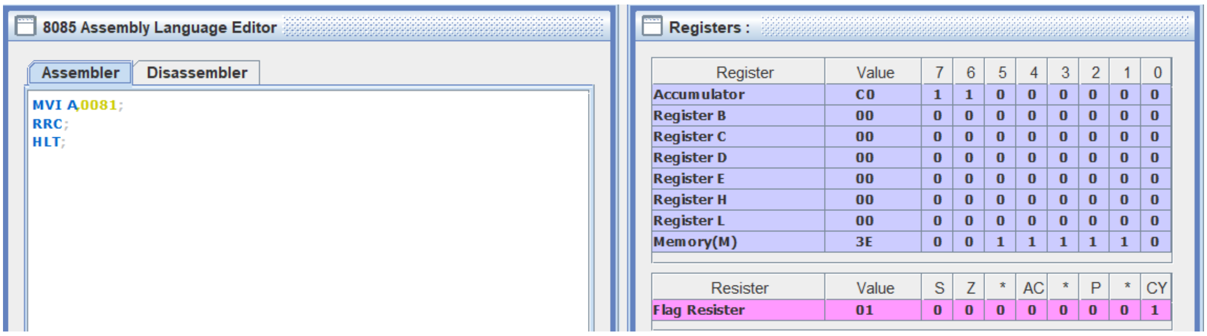
- 

```
MVI A,0081;
RLC;
HLT;
```

Register	Value	7	6	5	4	3	2	1	0
Accumulator	03	0	0	0	0	0	0	1	1
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	3E	0	0	1	1	1	1	1	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	01	0	0	0	0	0	0	0	1

RRC

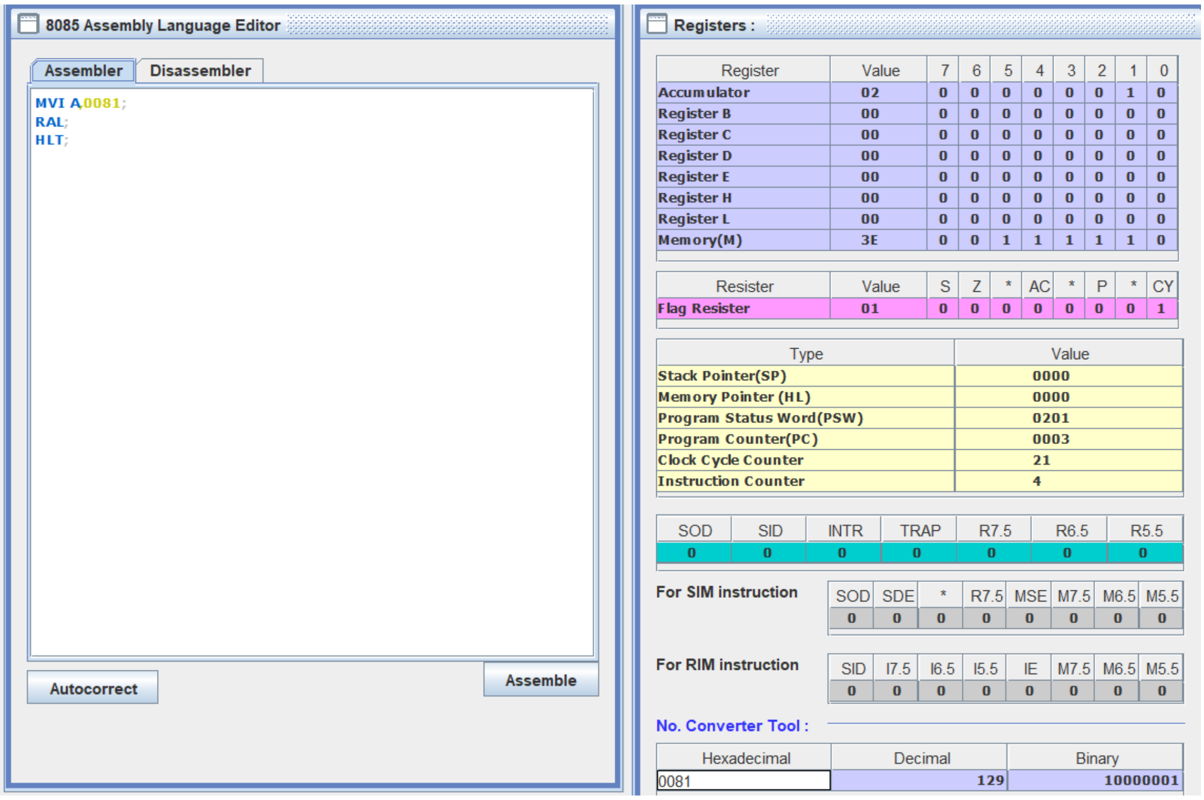
- Rotate Accumulator Right
- Syntax: RRC
- Working: The bit shifted out (from the least significant bit, LSB) is placed into the carry flag, and the carry flag's previous value is placed into the most significant bit (MSB) of the accumulator.
- 

```
MVI A,0081;
RRC;
HLT;
```

Register	Value	7	6	5	4	3	2	1	0
Accumulator	C0	1	1	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	3E	0	0	1	1	1	1	1	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	01	0	0	0	0	0	0	0	1

RAL

- Syntax: RAL
- Working: Rotate the accumulator left through carry
- 

```
MVI A,0081;
RAL;
HLT;
```

Register	Value	7	6	5	4	3	2	1	0
Accumulator	02	0	0	0	0	0	0	1	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	3E	0	0	1	1	1	1	1	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	01	0	0	0	0	0	0	0	1

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	0000
Program Status Word(PSW)	0201
Program Counter(PC)	0003
Clock Cycle Counter	21
Instruction Counter	4

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

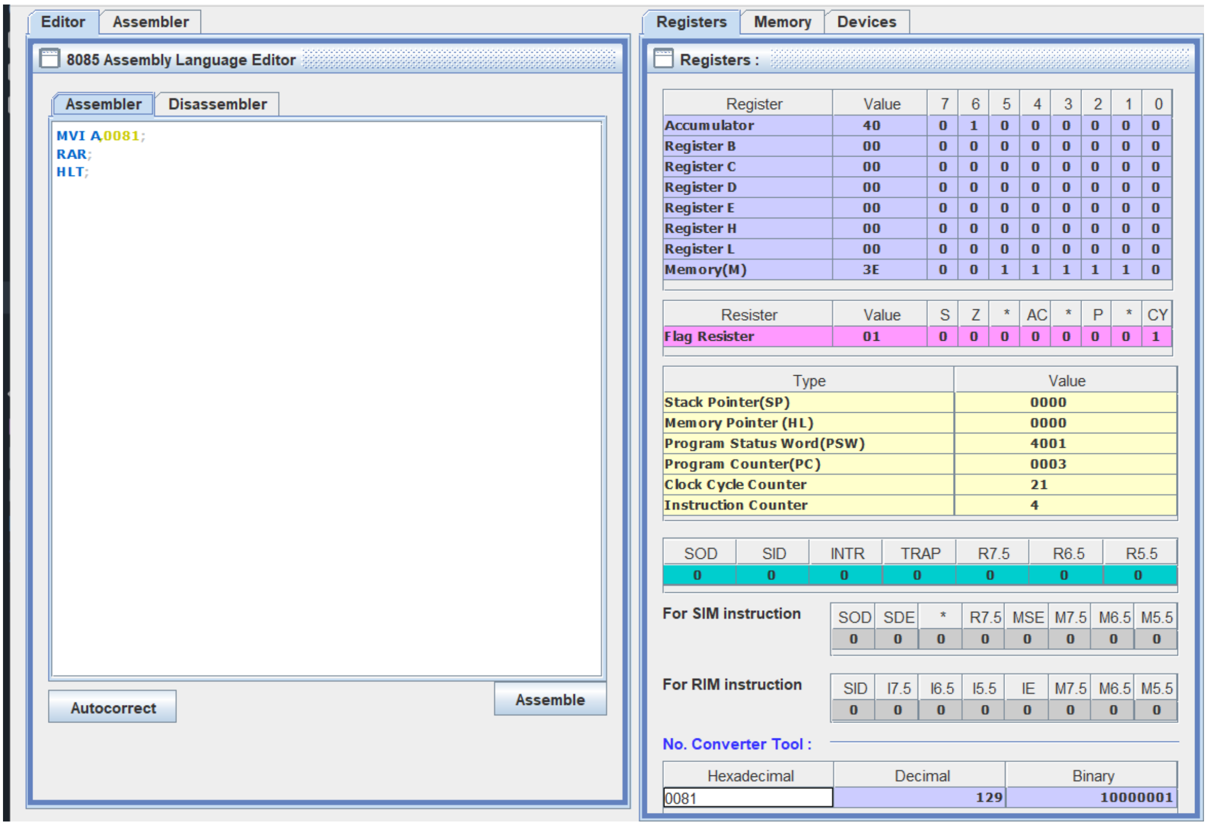
SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

Hexadecimal	Decimal	Binary
0081	129	10000001

RAR

- Syntax: `RAR`
- Working: Rotate Accumulator Right through Carry
- 

```
MVI A,0081;
RAR;
HLT;
```

Register	Value	7	6	5	4	3	2	1	0
Accumulator	40	0	1	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	3E	0	0	1	1	1	1	1	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	01	0	0	0	0	0	0	0	1

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	0000
Program Status Word(PSW)	4001
Program Counter(PC)	0003
Clock Cycle Counter	21
Instruction Counter	4

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal	Decimal	Binary
0081	129	10000001

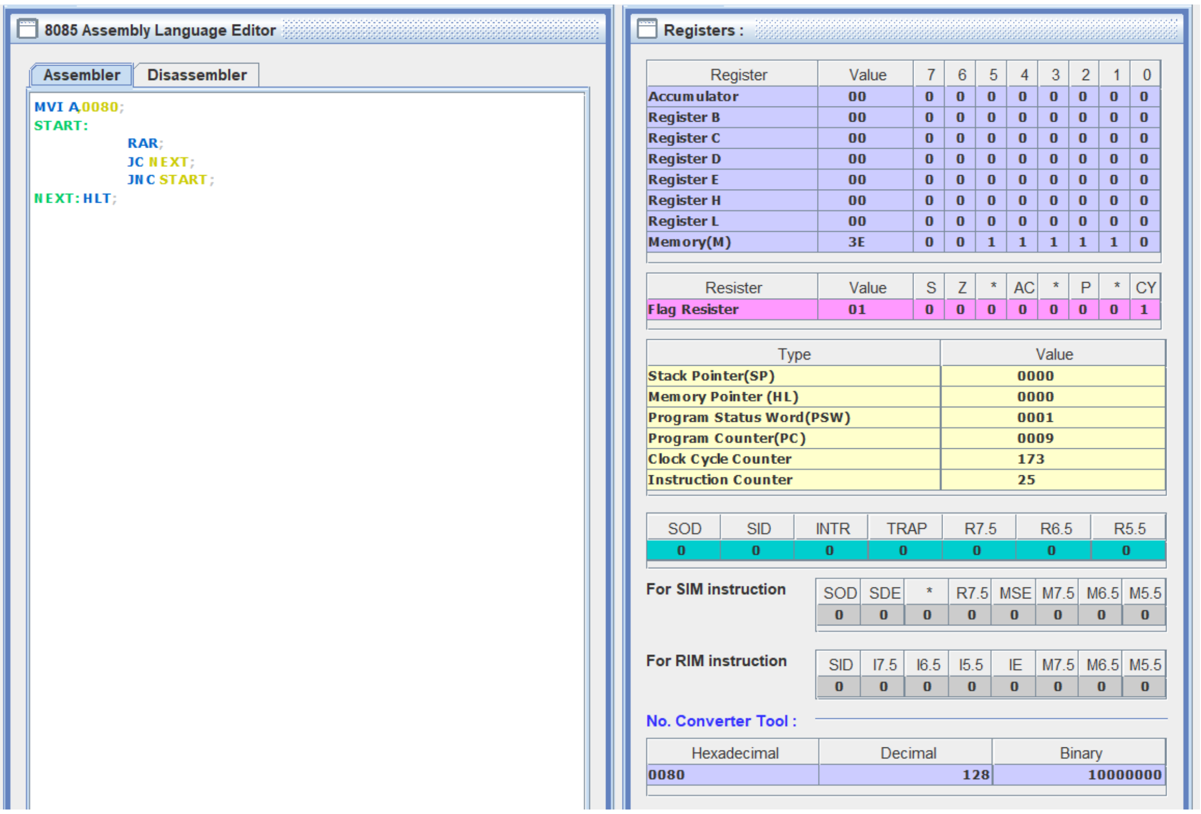
2. Explore following Branching instructions of 8085. JUMP (Unconditional and Conditional

JMP

- Jump
- Syntax: `JMP addr`
- Working: The JMP instruction is an unconditional jump instruction. It is used to transfer the control of the program to a specified memory location.

JC AND JNC

- JUMP if carry
- JUMP if not carry
- Working:
  - JC: The program sequence is transferred to a particular level or a 16-bit address if C=1 (or carry is 1)
  - JNC:The program sequence is transferred to a particular level or a 16-bit address if C=0 (or carry is 0)



```
MVI A,0080;
START:
            RAR;
            JC NEXT;
            JNC START;
NEXT:HLT;
```

Register	Value	7	6	5	4	3	2	1	0
Accumulator	00	0	0	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	3E	0	0	1	1	1	1	1	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	01	0	0	0	0	0	0	0	1

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	0000
Program Status Word(PSW)	0001
Program Counter(PC)	0009
Clock Cycle Counter	173
Instruction Counter	25

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

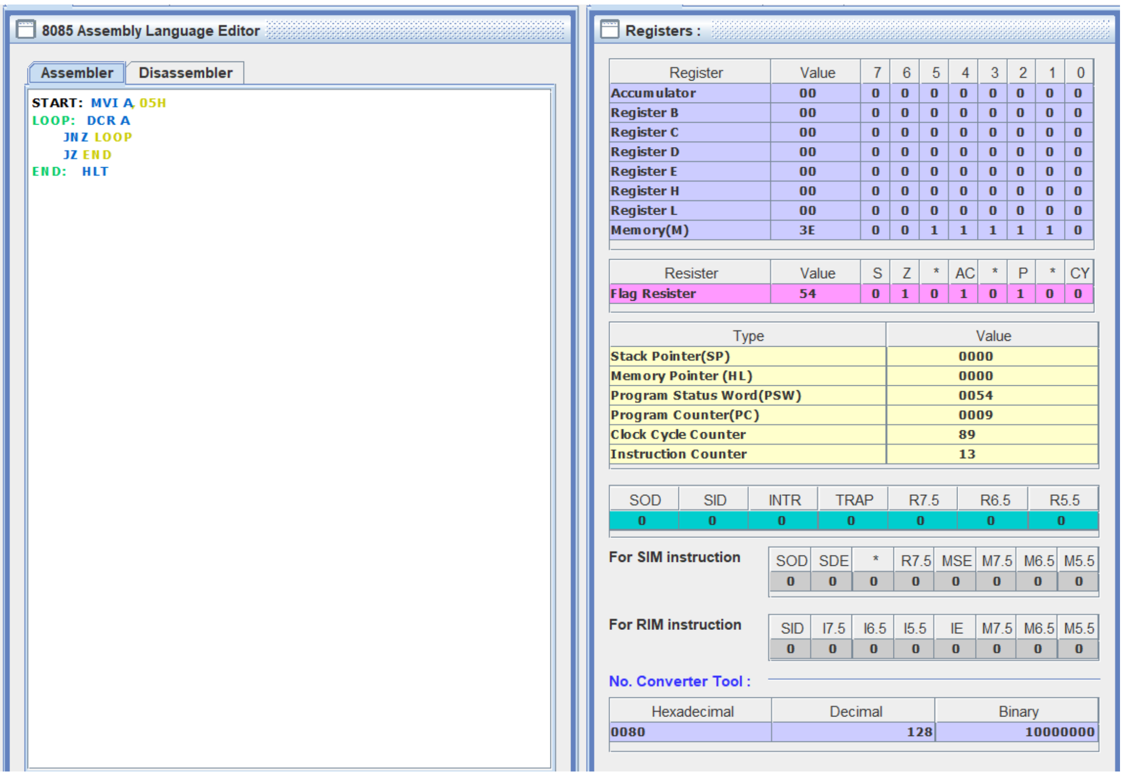
SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal	Decimal	Binary
0080	128	10000000

JZ AND JNZ

- Working:
  - JZ: The program sequence is transferred to a particular level or a 16-bit address if Z=1 (or zero flag is 0)
  - JNZ: The program sequence is transferred to a particular level or a 16-bit address if Z=0 (or zero flag is 0)



```
START: MVI A, 05H
LOOP:  DCR A
    JNZ LOOP
    JZ END
END:   HLT
```

Register	Value	7	6	5	4	3	2	1	0
Accumulator	00	0	0	0	0	0	0	0	0
Register B	00	0	0	0	0	0	0	0	0
Register C	00	0	0	0	0	0	0	0	0
Register D	00	0	0	0	0	0	0	0	0
Register E	00	0	0	0	0	0	0	0	0
Register H	00	0	0	0	0	0	0	0	0
Register L	00	0	0	0	0	0	0	0	0
Memory(M)	3E	0	0	1	1	1	1	1	0

Resister	Value	S	Z	*	AC	*	P	*	CY
Flag Resister	54	0	1	0	1	0	1	0	0

Type	Value
Stack Pointer(SP)	0000
Memory Pointer (HL)	0000
Program Status Word(PSW)	0054
Program Counter(PC)	0009
Clock Cycle Counter	89
Instruction Counter	13

SOD	SID	INTR	TRAP	R7.5	R6.5	R5.5
0	0	0	0	0	0	0

For SIM instruction

SOD	SDE	*	R7.5	MSE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

For RIM instruction

SID	I7.5	I6.5	I5.5	IE	M7.5	M6.5	M5.5
0	0	0	0	0	0	0	0

No. Converter Tool :

Hexadecimal	Decimal	Binary
0080	128	10000000

LAB ASSIGNMENT

1. Write an Assembly language program in 8085 to find whether the given number is even or odd. If the number is even, then store 01H at memory location 1110H, otherwise store 02H at the same location.

```
MVI A,007F;
START:
RAR ;
JC ODD;
JC EVEN;
EVEN:
LXI H, 0110H
MVI M,01H;
ODD:
LXI H, 0110H
MVI M,02H;
HLT;
```

---

2. Write an Assembly Language Program to load the Hexadecimal Numbers 9BH and A7H in Registers D and E respectively, and add the numbers. If the Sum is greater than FFH, then display 01H at the memory location 1000H, otherwise display the sum.

```
MVI D,FFH;
MOV A,D;
MVI E,0001;
START:
ADD E;
JC OVERFLOW;
JNC OUTPUT;
OVERFLOW:
MVI A,FFH;
STA 1000H;
OUTPUT:
STA 1001H;
HLT;
```

---

3. Write an Assembly language program in 8085 to Count number of 1's of the content of the register D and store the count in the register C.
   - INPUT: DAH
   - OUTPUT: 5

-
  ```
  MVI A,5CH;
  MOV B,A;
  CHECK:
      RRC ;
      JC INCREMENT
      CONTINUE:
  ```

```
    CMP B;
    JZ END;
    JMP CHECK;
INCREMENT:
    INR L;
    JMP CONTINUE;
END:
MOV C,L;
HLT;
```

---

4. Write an Assembly language program in 8085 to Move a block of 8 byte data stored from DF10H - DF17H to DF70H - DF77H.

- 8 Byte Block: 11,22,33,44,55,66,77,88

-
  ```
   LXI H,DF10H
   MVI C,08H
   INIT:
         MOV A,C
         MOV M,A
         INX H
         DCR C
         JNZ INIT
         LXI H, DF10H
         LXI D, DF70H
         MVI C, 08H
   MOVE:
         MOV A,M
         STAX D
         INX H
         INX D
         DCR C
         JNZ MOVE
   HLT
  ```

---

5. Write an Assembly program in 8085 to multiply a given number by 2 using Rotate instructions.

- Left Shift Always means multiplying by 2

-
  ```
  MVI A,5CH;
  RAL;
  HLT;
  ```

> END OF DOCUMENT