Sorting of numbers in a sequence

Exp 3 (a) : Ascending Order

Aim :

To write and execute an 8085 program to sort a set of numbers in ascending order.

Apparatus Required:

• 8085 Online Simulator (8085simulator.github.io or similar)
• Test input data
• Instruction set reference

Algorithm (Ascending Order):

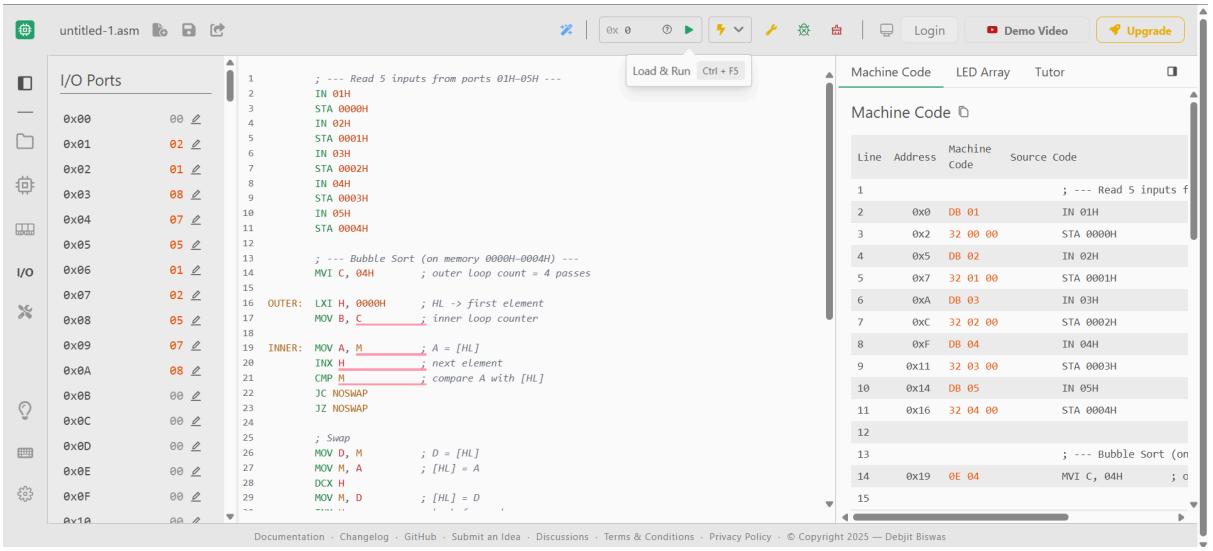
1. Load count from memory into register C.
2. Subtract 1 from count and store in B (outer loop counter).
3. Outer loop (B times):
   Point HL to the first data.
   Copy C to D (inner loop counter).
   Inner loop (D times):
   Compare adjacent elements.
   If current > next, swap them.
   Decrement B and repeat.
4. End.

Program:

```
; --- Read 5 inputs from ports 01H–05H ---
 IN 01H
 STA 0000H
 IN 02H
 STA 0001H
 IN 03H
 STA 0002H
 IN 04H
 STA 0003H
 IN 05H
```

```
        STA 0004H

        ; --- Bubble Sort (on memory 0000H–0004H) ---
        MVI C, 04H        ; outer loop count = 4 passes

OUTER:  LXI H, 0000H      ; HL -> first element
        MOV B, C          ; inner loop counter

INNER:  MOV A, M          ; A = [HL]
        INX H             ; next element
        CMP M             ; compare A with [HL]
        JC NOSWAP
        JZ NOSWAP

        ; Swap
        MOV D, M          ; D = [HL]
        MOV M, A          ; [HL] = A
        DCX H
        MOV M, D          ; [HL] = D
        INX H             ; back forward

NOSWAP: DCR B
        JNZ INNER

        DCR C
        JNZ OUTER

        ; --- Output sorted numbers to ports 06H–0AH ---
        LDA 0000H
        OUT 06H
        LDA 0001H
        OUT 07H
        LDA 0002H
        OUT 08H
        LDA 0003H
        OUT 09H
        LDA 0004H
        OUT 0AH

        HLT
```

Output:



Input Ports:

- 01H → First number
- 02H → Second number
- 03H → Third number
- 04H → Fourth number
- 05H → Fifth number

Output Ports (Sorted Result):

- 06H → Smallest number
- 07H → 2nd number
- 08H → 3rd number
- 09H → 4th number
- 0AH → Largest number

Result:

The 8085 assembly language program was successfully executed to sort a set of numbers in ascending order.

Exp 3 (b) : Descending Order

Aim:

To write and execute an 8085 program to sort a set of numbers in descending order.

Apparatus Required:

• 8085 Online Simulator • Hex input data • Instruction set reference

Algorithm (Descending Order):

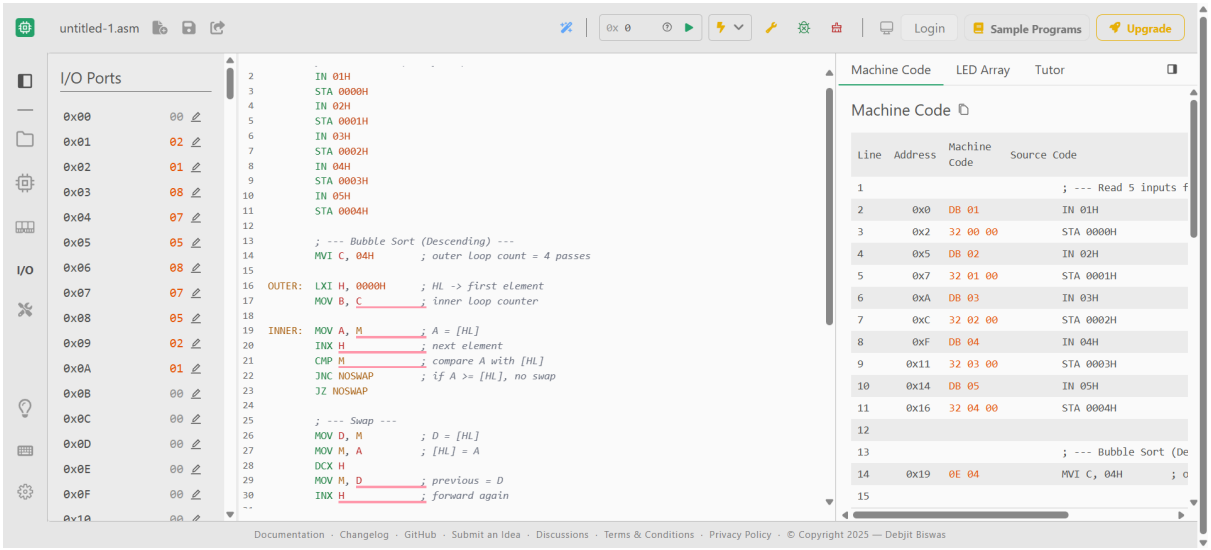
1. Load the count of numbers from memory into register C.
2. Subtract 1 from count and store in B.
3. Outer loop (B times):
   Point HL to first number.
   Copy count to D.
   Inner loop (D times):
   Compare adjacent numbers.
   If current < next, swap them.
4. Repeat until sorted.

Program:

```
; --- Read 5 inputs from ports 01H–05H ---
IN 01H
STA 0000H
IN 02H
STA 0001H
IN 03H
STA 0002H
IN 04H
STA 0003H
IN 05H
```

```
        STA 0004H

        ; --- Bubble Sort (Descending) ---
        MVI C, 04H        ; outer loop count = 4 passes

OUTER:  LXI H, 0000H      ; HL -> first element
        MOV B, C          ; inner loop counter

INNER:  MOV A, M          ; A = [HL]
        INX H             ; next element
        CMP M             ; compare A with [HL]
        JNC NOSWAP        ; if A >= [HL], no swap
        JZ NOSWAP

        ; --- Swap ---
        MOV D, M          ; D = [HL]
        MOV M, A          ; [HL] = A
        DCX H
        MOV M, D          ; previous = D
        INX H             ; forward again

NOSWAP: DCR B
        JNZ INNER

        DCR C
        JNZ OUTER

        ; --- Output sorted numbers to ports 06H–0AH ---
        LDA 0000H
        OUT 06H           ; Largest
        LDA 0001H
        OUT 07H
        LDA 0002H
        OUT 08H
        LDA 0003H
        OUT 09H
        LDA 0004H
        OUT 0AH           ; Smallest

        HLT
```

Output:



Port Mapping

- **Input Ports**:
    - `01H` → First number
    - `02H` → Second number
    - `03H` → Third number
    - `04H` → Fourth number
    - `05H` → Fifth number
- **Output Ports (Descending Order)**:
    - `06H` → Largest number
    - `07H` → 2nd largest
    - `08H` → Middle value
    - `09H` → 2nd smallest
    - `0AH` → Smallest number

Result:

The 8085 assembly language program was successfully executed to sort a set of numbers in descending order.