# Assignment 8 (By Utkarsh Ranjan)

# Problem 1

**Variable**

An array with 6 bytes of entries.
The 1st byte represented the length of the array 'N'
The other 5 bytes were the elements of the actual array to be sorted.

**Algorithm**

Bubble Sort

- It is the sorting algorithm that works by repeatedly swapping the adjacent elements if they are in wrong order.
- The program had two loop, one was for the number of iterations over the array, while another was for  a scan over the array and further swapping the elements.

**Design of the program**

**a. Copying variable**

- R2 had the address 0x40000000
- First the variable was stored in the register R0. From there it was copied to the location stored in the register R2.

```
FOR_COPY
        LDRB    R1,[R0],#01
        STRB    R1,[R2],#01
        SUBS    R8,R8,#01
        CMP     R8,#0
        BNE     FOR_COPY
```

**b. First Loop**

- In this loop Two register R2,R3 were used to make a scan of the array.
- The values of these two registers were compared, if they were in correct order, the control flow of the program was sent to the loop2.

```
LOOP    LDRB    R2,[R1],#01
        LDRB    R3,[R1]
        CMP     R2,R3
        BLT     LOOP2
        STRB    R2,[R1],#-01
        STRB    R3,[R1]
        MOV     R7,#01
        ADD     R1,#01
```

**c. Second Loop**

- This loop kept the count of the number of elements read in the array.

- If all elements were read it sends it to the start of the programme, else it checks if R7 is 0 or not.
- If R7 is 0, the programme  terminates.
- R7 remembers whether a swap was made in this iteration over the array.

```
LOOP2
        SUBS    R5,R5,#01
        CMP     R5,#0
        BNE     LOOP
        CMP     R7,#0
        BNE     START1
```