LAB-5

SORTING AND SEARCHING PROGRAMS

Objectives:

In this lab, students will be able to

- Perform advanced list operations in a given list or array.
- Use different branch instructions.

- Write an ARM ALP to sort a list using bubble sort.

```
                AREA    RESET, DATA, READONLY
                EXPORT  __Vectors
    __Vectors
                DCD  0x40001000     ; stack pointer value when stack is empty
                DCD  Reset_Handler  ; reset vector
                ALIGN
                AREA ascend, code, readonly
                ENTRY
  Reset_Handler
                mov r4,#0
                mov r1,#10
                ldr r0, =list
                ldr r2, =result
          up    ldr r3, [r0,r4]
                str r3, [r2,r4]
                add r4, #04
                sub r1,#01
                cmp r1,#00
                bhi up
                ldr r0, =result
```

```
        mov r3, #10                     ; inner loop counter
        sub r3, r3, #1
        mov r9, r3                      ; R9 contain no of passes
                                        ; outer loop counter
outer_loop
        mov r5, r0
        mov r4, r3                      ; R4 contains no of comparison in a pass
inner_loop
        ldr r6, [r5], #4
        ldr r7, [r5]
        cmp r7, r6
                                        ; swap without swap instruction
        strls r6, [r5]
        strls r7, [r5, #-4]
        subs r4, r4, #1
        bne inner_loop
        sub r3, #1
        subs r9, r9, #1
        bne outer_loop
list dcd 0x10,0x05,0x33,0x24,0x56,0x77,0x21,0x04,0x87,0x01
     AREA data1, data, readwrite
result DCW 0,0,0,0,0,0,0,0,0,0
        end
```

❖ Lab Exercises:

1. Write an assembly program to sort an array using selection sort
2. Write an assembly program to find the factorial of a unsigned number using recursion.
3. Write an assembly program to search an element in an array of ten 32 bit numbers using linear search.
4. Assume that ten 32 bit numbers are stored in registers R1-R10. Sort these numbers in the fully ascending stack using selection sort and store the sorted array back into the registers. Use STM and LDMDB instructions wherever necessary.

❖ Additional Exercises:

1. Repeat question 4 for fully descending stack using STMDB and LDM instruction wherever necessary.
2. Write an 8086 ALP that contains a list of numbers and makes a count of
a) Even and Odd numbers. b) Numbers greater than 10