URBAN EDGE

Lab-05 - Sorting And Searching Problems

(1) Write an assembly program to sort an array using selection sort.

```
AREA RESET, DATA, READONLY
EXPORT __Vectors
__Vectors
DCD 0x10001000
DCD Reset_Handler
Reset_Handler ALIGN
AREA myCode, CODE, READONLY
ENTRY
EXPORT Reset_Handler
Reset_Handler
LDR R0, =NUM
LDR R1, =DEST
MOV R4, #4
MOV R10, #0

LOOP1 LDR R2, [R0, R3]
ADD R3, R3, #4
CMP R2, R0
BEQ START
STR R2, [R1], #4
B LOOP1

START MOV R5, #255
MOV R3, #0
LDR R1, =DEST
MOV R0, #0
LOOP2 LDR R2, [R1, R3]
CMP R2, #0
BEQ FOUND
CMP R2, R5
```

```
        BLS UPDATE:
RET     ADD R3,R3,#4
        B LOOP2

UPDATE  MOV R5,R2
        MOV R6,R3
        B RET

FOUND   LDR R1, =DEST
        LDR R7, [R1,R10]
        ADD R6, R6, R10
        STR R7, [R1, R6]
        STR R5, [R1,R10]
        ADD R10, R10, #4
        ADD R0, R0, #4
        MOV R6, #0
        ADD R1, R1,R0
        MOV R3, #0
        MOV R5, #255
        LDR R2, [R1]
        CMP R2, #0
        BNE LOOP2
STOP    B STOP
NUM     DCD 0x4, 0x2, 0x1, 0x3
        AREA data, DATA, READWRITE
DEST    DCD 0,0,0,0
        END.
```

Register Window

R0 → 0x00 → 0x10
R1 → 0x00 → 0x10
R4 → 0x00 → 0x04
R5 → 0x00 → 0xFF
R7 → 0x00 → 0x04
R10 → 0x00 → 0x10

Output :

0x10000000 : 00 00 0000 00000000 00 000000

↓

00 00 0000

04 00 00 00 02 00 0000 01 000000 03 000000

↓

01 00 0000 02 00 0000 03000000 04000000

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(2) Write assembly program to find factorial of unsigned number using recursion

```
AREA RESET, DATA, READONLY
EXPORT __Vectors
__Vectors
  DCD 0x10001000
  ALIGN
  AREA mycode, CODE, READONLY
ENTRY
  EXPORT Reset_Handler
    LDR R0, =NUM
    LDR R1, =DEST
    MOV R10, #0
    LDR R2, [R0]
    MOV R3, #1
    B CONV:

MULT  MUL R3, R2, R3
      SUBS R2, R2, #1
      CMP R2, #0
      BHI MULT
      BX LR
CONV  .BL: MULT.
      MOV R0, #10
      MOV R2, R3
      MOV R4, #0
      MOV R6, #0
DIV10 SUB R2, R2, R0
      ADD R4, R4, #1
      CMP R2, R0
      BHS DIV10
      B ADDTO
```

```
ADDTO   ADD R10, R10, R2
        ADD R6, R6, #1
        LSL R10, #4
        MOV R2, R4
        MOV R4, #0
        CMP R2, R0
        BHS DIV10
        CMP R2, #0
        BHI EXTRA
        B REVERSE
EXTRA   ADD R10, R10, R2
        ADD R6, R6, #1
REVERSE AND R0, R10, #0X0F
        ADD R9, R9, R0
        SUB R6, R6, #1
        CMP R6, #0
        BEQ exit
        LSL R9, #4
        LSR R10, #4
        B REVERSE
exit    STR R9, [R1]
STOP B  STOP
NUM     DCD 4
        AREA data, DATA, READWRITE
DEST    DCD 0
        END
```

Register window

R0 → 0x00 → 0x04

R1 → 0x00 → 0x10000000

R2 → 0x00 → 0x62

R3 → 0x00 → 0x18

R9 → 0x00 → 0x24

R10 → 0x00 → 0x42 → 0x04

Output

0x10000000 : 00 00 00 00

⇓

0x10000000 : 24 00 00 00

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(8) WAP to linear search an element in an array of 10 32 bit numbers.

```
    AREA RESET, DATA, READONLY
    EXPORT __Vectors
__Vectors
    DCD 0X10001000
    DCD Reset_Handler
Reset_Handler
    LDR R0, =NUM
    LDR R1, =NUM2
    MOV R2, #0
    MOV R5, #0
    LDR R4, [R1]
LOOP LDR R3, [R0, R2]
    ADD R2, R2, #4
    CMP R3, R4
    BEQ SUCCESS
    CMP R3, #R0   2. correct
    BEQ FAIL
    ADD R5, R5, #1
    B LOOP
SUCCESS LDR R6, =DEST
    STR R5, [R6]
    B DONE
FAIL LDR R6, =DEST
    MOV R7, #-1
    STR R7, [R6]
DONE
STOP B STOP
NUM DCD 1,2,3,4,5,6,7,8,9,10
NUM2 DCD 4
    AREA data, DATA, READWRITE
DEST DCD 0
    END
```

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Register Windows

R0 → 0x00 → 0x3C

R1 → 0x60 → 0x64

R2 → 0x00 → 0x16

R3 → 0x00 → 0x04

R4 → 0x00 → 0x04

R5 → 0x00 → 0x03

R6 → 0x10000000

Memory

0x10000000 : 00 00 00 00

↓

03 00 00 00 00

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