UNIVERSITY OF CALIFORNIA, RIVERSIDE

Department of Computer Science and Engineering
CS61 – Machine Organization and Assembly Language
Lab Assignment 4
Given August 16, Due 3:00 pm August 20, 2001

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1. Assume a sequence of nonnegative integers is stored in consecutive memory locations, one integer per memory location, starting at location x4000. Each integer has a value between 0 and 30,000 (decimal). The sequence terminates with the value –1(xFFFF). What does the following program do?

```
            .ORIG   x3000
            AND     R4,R4,#0
            AND     R3,R3,#0
            LD      R0,NUMBERS
LOOP        LDR     R1,R0,#0
            NOT     R2,R1
            BRz     DONE
            AND     R2,R1,#1
            BRz     L1
            ADD     R4,R4,#1
            BRnzp   NEXT
L1          ADD     R3,R3,#1
NEXT        ADD     R0,R0,#1
            BRNZP   LOOP
DONE        TRAP    x25
NUMBERS     .FILL   x4000
            .END
```

2. Write a Bubble sort program as a SUBROUTINE. Then write the main program that inputs one-digit positive integers (the number of these integers is not more than 16) until a zero is entered. It then calls the Bubble sort subroutine, which sorts those numbers. When it returns, have the main program output the sorted numbers on the console.

Use LC-2 simulator to run your program, and write down the content in your registers (R0 – R7) on your lab report along with your program.