

Homework06

1. The following program is supposed to print the number 5 on the screen. It does not work. Why? Answer in no more than ten words, please.

```
1      .ORIG  x3000
2      JSR   A
3      OUT          ;TRAP x21
4      BRnzp DONE
5  A    AND   R0,R0,#0
6      ADD   R0,R0,#5
7      JSR   B
8      RET
9  DONE HALT
10  ASCII .FILL x0030
11  B    LD   R1,ASCII
12      ADD   R0,R0,R1
13      RET
14      .END
```

2. The following LC-3 program is assembled and then executed. There are no assemble time or run-time errors. What is the output of this program? Assume all registers are initialized to 0 before the program executes.

```
1      .ORIG x3000
2      ST R0, #6 ; x3007
3      LEA R0, LABEL
4      TRAP x22
5      TRAP x25
6  LABEL .STRINGZ "FUNKY"
7  LABEL2 .STRINGZ "HELLO WORLD"
8      .END
```

3. The following nonsense program is assembled and executed.

```

1      .ORIG x4000
2      LD R2,BOBO
3      LD R3,SAM
4  AGAIN  ADD R3,R3,R2
5      ADD R2,R2,#-1
6      BRnzp SAM
7  BOBO  .STRINGZ "Why are you asking me this?"
8  SAM   BRnp AGAIN
9      TRAP x25
10     .BLKW 5
11  JOE  .FILL x7777
12     .END

```

How many times is the loop executed? When the program halts, what is the value in R3? (If you do not want to do the arithmetic, it is okay to answer this with a mathematical expression.)

4. The program below, when complete, should print the following to the monitor:

ABCFGH

Insert instructions at (a)-(d) that will complete the program.

```

1      .ORIG x3000
2      LEA R1, TESTOUT
3  BACK_1 LDR R0, R1, #0
4      BRz NEXT_1
5      TRAP x21
6      ----- (a)
7      BRnzp BACK_1
8      ;
9  NEXT_1 LEA R1, TESTOUT
10 BACK_2 LDR R0, R1, #0
11      BRz NEXT_2
12      JSR SUB_1
13      ADD R1, R1, #1
14      BRnzp BACK_2
15      ;
16  NEXT_2 ----- (b)
17      ;
18  SUB_1 ----- (c)
19  K     LDI R2, DSR
20      ----- (d)
21      STI R0, DDR
22      RET
23  DSR  .FILL xFE04
24  DDR  .FILL xFE06

```

```

25 TESTOUT .STRINGZ "ABC"
26         .END

```

5. Shown below is a partially constructed program. The program asks the user his/her name and stores the sentence "Hello, name" as a string starting from the memory location indicated by the symbol HELLO. The program then outputs that sentence to the screen. The program assumes that the user has finished entering his/her name when he/she presses the Enter key, whose ASCII code is x0A. The name is restricted to be not more than 25 characters.

Assuming that the user enters Onur followed by a carriage return when prompted to enter his/her name, the output of the program looks exactly like:

```

Please enter your name: Onur
Hello, Onur

```

Insert instructions at (a)-(d) that will complete the program.

```

1          .ORIG x3000
2          LEA R1,HELLO
3 AGAIN    LDR R2,R1,#0
4          BRz NEXT
5          ADD R1,R1,#1
6          BR AGAIN
7 NEXT     LEA R0,PROMPT
8          TRAP x22          ; PUTS
9          ----- (a)
10 AGAIN2  TRAP x20          ; GETC
11         TRAP x21          ; OUT
12         ADD R2,R0,R3
13         BRz CONT
14         ----- (b)
15         ----- (c)
16         BR AGAIN2
17 CONT    AND R2,R2,#0
18         ----- (d)
19         LEA R0, HELLO
20         TRAP x22          ; PUTS
21         TRAP x25          ; HALT
22 NEGENTER .FILL xFFF6      ; -x0A
23 PROMPT  .STRINGZ "Please enter your name: "
24 HELLO   .STRINGZ "Hello, "
25         .BLKW #25
26         .END

```