ECE 220 Review

HKN

Usage of KBDR and KBSR

KBSR or Keyboard Status Register :-

- Location : xFE00

- Bit[15] is one when keyboard has received a new character.

KBDR or Keyboard Data Register:-

- Location : xFE02

- Bits[7:0] contain the last character typed on the keyboard.

Need to understand how to use it. Try it AT HOME afterwards if you haven't already. This was tested on last semester!!!! (For almost 10-15 points)

JSR, JSRR and RET

1) JSR :-

    a) R7 <- PC

    b) PC <- PC + SEXT(PCOffset11)

2) JSRR :-

    a) R7 <- PC

    b) PC <- BaseR {Hardly used}

3) RET :-

    a) PC <- R7;

Stack

- Last In First Out Data Structure

- Operations like PUSH,POP,IsEmpty,IsFull are important

- Subroutines like PUSH and POP are useful here

- (Usually their implementation would be given; but I would suggest understanding how they work or writing them on your cheat sheet just in case)

- PUSH is the subroutine to save when we enter

- POP to restore before we return

Understanding Subroutines vs Branching

- Rule of Thumb(like a Hack) : If it's after HALT it is most likely a subroutine. Don't try to Branch. It might work but TA's take 10 points off.

- Always save R7 when you call a subroutine from another subroutine!!!

- RET gets you back to the calling routine.

- Branching is just like an If-Else statement. Make sure its inside the main function of LC3 or in a subroutine.

Some tips for exam

1) Make sure your VM is in order if you are using your laptop

2) Make sure it has 100% battery

3) You should have enough time for the exam. It's designed in a way that professors can do it in 15-20 min and TA's in 45-60 min, so you should be fine in 2.5 hours(hopefully).

4) Don't spend too much time on a question.

5) Remember Partial Credit is there(LOTS OF IT) so even if you write JSR PUSH and RET in a stack question and you don't know anything else you get 5 points.

Conceptual Questions on LC-3

1) Which components (e.g., the LC3, the keyboard, or the display) writes to the DSR and the DDR? Explain in words what problem could occur if the component writes to DDR before checking DSR?

2) The following program is supposed to print the number '5' (i.e. ASCII value x0035) on the screen but it does not work. Why? How can you fix it? Answer with a couple of short sentences, and show the code snippets to be added, removed or changed

```
           .OIRG x3000
           JSR A
           OUT
           BRnzp DONE
A          AND R0, R0, #0
           ADD R0, R0, #5
           JSR B
           RET
DONE       HALT
ASCII      .FILL x0030
B          LD R1, ASCII
           ADD R0, R0, R1
           RET
           .END
```

LC-3 Easy Question - 1

Write a subroutine in LC3 called POWER to check whether a given input positive integer is a power of 2. (Ex. 1, 2, 4, 8, 16, 32...).

Details

The input positive integer N will be provided in memory location x5000. Register R0 must contain the output --- 1 if N is a power of 2, 0 otherwise. Write this output value to memory location x5001. Hint: Think about representation of all numbers that are powers of 2.

Instructions

- Write your code in question1/power2.asm.
- To test your code, write different values at x5000.

You should be able to do the above question in at least 10-20 minutes!!

Let's do a bit harder problem. Sp16 Q3 - Reverse
This is Practice Exam 2. Think about it for 10-15 min.

Approach to solving LC-3 problems

1) Read the question properly(This is more important than you think it is when LC3 is involved). At least twice.

2) Understand what subroutines are to be used if any.

3) You will most likely be given the algorithm/ flowchart. You just need to convert it into LC-3 code.

4) Try to use first 10 min of every question to plan it out. Do the question first that seems easy and you seem confident about it.

5) Use the lc3sim-tk if any bug however little it is. It's your best friend.

6) If your code doesn't work don't erase it. Partial credit will be given to you.

GOOD LUCK FOR THE EXAM!!
Welcome to the world of programming.

Let's do a bit harder problem. Sp16 Q2 - Base 7
This is Practice Exam 2. Think about it for 10-15 min.