ECE 375 PRELAB 3

Lab Time: Tuesday 4-6

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QUESTIONS

1. What is the stack pointer? How is the stack pointer used, and how do you initialize it? Provide pseudocode (not actual assembly code) that illustrates how to initialize the stack pointer.

   The stack pointer points to the top of the stack; this is for the top of the stack to be easily referenced. The stack pointer gets incremented and decremented based on what functions are called on the stack. The stack pointer is pre-incremented prior to functions such as Pop and post-decremented after functions such as Push. It is implemented as growing from higher memory locations to lower memory locations. The Stack Pointer is implemented as two 8-bit Special Function Registers, Stack Pointer High Register and Stack Pointer Low Register.

   Pseudocode to initialize stack pointer:

   ```
   Include definition file to initialize stack pointer

   Write Low Byte of End SRAM Address to SPL

   Write High Byte of End SRAM Address to SPH
   ```

2. What does the AVR instruction LPM do, and how do you use it? Provide pseudocode (not actual assembly code) that shows how to setup and use the LPM instruction

LPM is abbreviated for Load Program Memory. This Loads one byte pointed to by the Z-register into the destination register Rd. LPM allows constant data fetch. LPM can be used to read the Fuse and Lock bit values if the device has self programming capabilities.

If you wanted to load the address of a message into the z register, you could do the following

Pseudocode:

```
Call LPM instruction. This loads byte from program memory into r0

Check if you've reached the end of the message

If so, quit

Put character onto Port B

Increase Z registers
```

3. Take a look at the definition file m128def.inc (This file can be found in the Solution Explorer → Dependencies folder in Atmel Studio, assuming you have an Assembler project open and you have already built an assembly program that includes this definition file. Two good examples of such a project would be your Lab 1 and Lab 3 projects.) What is contained within this definition file? What are some of the benefits of using a definition file like this? Please be specific, and give a couple examples if possible.

m128def.inc is a definition file, containing addresses and values for I/O registers and special registers within a certain chipset. The definition file benefits the programmer, as they don't have to memorize or check the addresses of each I/O or chip specific register, and the code the programmer wrote can be used for entirely different chipset if the correct definition file is included.

Reference

http://ww1.microchip.com/downloads/en/devicedoc/atmel-0856-avr-instruction-set-manual.pdf

https://web.engr.oregonstate.edu/~jangha/ece375/pdf/starterguide.pdf

http://157.158.56.13/Electronics_Firm_Docs/ATMEL/Atmel/acrobat/doc1233.pdf