**EENG 260 (Microcontrollers)**

**Home Work 2**

**Problem 1:** Logical Operations

In class we said a divide by 2 operation can be achieved by a logical shift left instruction and also said a multiply by 2 operation can be achieved by an arithmetic shift right. Without worrying about the contents of the registers write out the mathematical expressions of R0 after each of the two instructions:

a) ADD R0, R1, LSL #4

b) ADD R0, R1, R2, ASR #4

Answer:

1. R0 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. R0 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Problem 2:** GPIO Memory Map

From the class notes titled “Lect\_On\_Ports\_Rev1” or chapter 10 of Tiva C manual it is said that **Port A** has the address range: 0x4000.4000 – 0x4000.4FFF.

1. What components are addressable in this address range?
2. Provide addresses, names and functions for some of these components

**Problem 3:** The stack (frame and pointer)

1. Provide a stack frame for a program that saves its contents from memory location 0x2000.7FFC, assume 5 words are saved.
2. Where does the return address of a subroutine get stored i.e., when a subroutine completes how does the program know where to start?
3. What is a stack overflow?
4. What is a stack underflow?

**Problem 4:** Exceptions and Interrupts

1. Please state the difference between an exception and an interrupt
2. What is the purpose of a vector table?
3. What is the purpose of an interrupt service routine?
4. Interrupts IRQ0 and IRQ1 have the same priority and both happen to occur at the same time. Which of the two interrupts will be serviced first?
5. Provide the steps taken by a processor to enter into an exception and how it returns from exception

**Problem 5:** GPIODATA Register

You have the following assembly instructions in your assembly code:

MOVW R1, #0x4000 ;load lower half of reg R1 with 0x4000

MOVT R1, #0x4000 ;load upper half of reg R1 with 0x4000

LDRB R0, #0x05 ;load value 5 into R0

STRB R0, [R1] ;store content of R) at memory location

pointed to by R1

After these four instructions execute:

1. What port is this program manipulating?
2. What register of this specific port is being manipulated?
3. How are this port’s pins configured?
4. Now that the port’s pins are set up what register would be used to Read date from or write data to the port?
5. Which pins of the port will be written to and which pins will be read from?