EE 308 – Homework 6

Due Feb. 29, 2012

1. The table below shows the contents of memory an MC9S12. Identify the return address to the main program if:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
1FD0	CC	05	9F	CD	99	03	84	9C	01	9B	CC	90	24	35	37	30
1FE0	7E	E3	4B	7E	E5	38	21	54	05	83	09	34	2A	38	3C	03
1FF0	41	38	20	35	22	C5	37	0C	25	F2	0C	38	35	2B	42	1A
2000	7A	26	21	13	6A	AA	20	1F	4B	38	33	38	45	38	10	20

   (a) The MC9S12 is in subroutine `sub2` which was called by subroutine `sub1`. The subroutines did not put anything else onto the stack. The stack pointer has a value of 0x1FF2. What is the return address to the main program (from where `sub1` was called)?

   (b) The MC9S12 is in an interrupt service routine `my_isr` that interrupted the main program. The stack pointer has a value of 0x1FF5. What is the return address to the main program? What were the values of the X, Y, A and B registers at the time of the interrupt? What was in the condition code register?

   (c) The MC9S12 is in a subroutine `sub3` that pushed both X and Y onto the stack (in that order). The stack pointer has a value of 0x1FD8. What is the return address the main program (from where `sub3` was called? What were the values of the X and Y register when `sub3` was called?

2. The prescaler bits of the `TSCR2` register are set to `PR2:0 = 100`. The first time the `TCNT` register is read the value is `0x3456`. The next time the `TCNT` register is read, the value is `0xABCD`. Assuming the time between reads was less than the overflow period of the counter, how much time (in seconds) passed between the two reads?

3. The prescaler bits of the `TSCR2` register are set to `PR2:0 = 100`. The first time the `TCNT` register is read the value is `0xABCD`. The next time the `TCNT` register is read, the value is `0x3456`. Assuming the time between reads was less than the overflow period of the counter, how much time (in seconds) passed between the two reads?

4. An MC9S12 has the following data in its memory:

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
FFC0	CC	05	9F	CD	99	03	84	9C	01	9B	CC	90	66	FC	93	30
FFD0	7E	E3	4B	7E	E5	38	21	54	05	83	09	34	2A	38	3C	03
FFE0	41	38	66	F2	7C	13	37	0C	25	F2	0C	38	5F	1B	42	1A
FFF0	7A	26	21	13	6A	AA	20	1F	4B	38	33	38	45	38	30	57

   (a) What happens to the program counter when the MC9S12 is powered up or reset? What is the address of the first instruction the MC9S12 will execute after a reset?

   (b) What is the address of the first instruction the MC9S12 will execute when it receives a Timer Overflow interrupt?

   (c) What is the address of the first instruction the MC9S12 will execute when it receives a SPI0 interrupt?

   (d) What is the address of the first instruction the MC9S12 will execute when it receives a Real Time interrupt?

5. Below are the values of some timer registers in the MC9S12:

TSCR1	TSCR2	TIE	TCTL1	TCTL2	TCTL3	TCTL4	TFLG1	TFLG2
80	83	05	C2	A4	5F	76	15	80

   (a) Is the Timer enabled?

   (b) Is the Timer Overflow Interrupt enabled?

   (c) Is the Timer Overflow Flag set?

   (d) What is the overflow time for the TCNT register; i.e., how long does it take for the TCNT register to count from 0x0000 to 0xFFFF, then back to 0x0000?

6. Write some assembly language code which will enable the timer subsystem, set the timer overflow rate to about 87 ms, and enable the timer overflow interrupt.

7. Write some C code which will enable the timer subsystem, set the timer overflow rate to about 87 ms, and enable the timer overflow interrupt.

8. Write some assembly language code which will enable the real time interrupt and set the real time interrupt rate to about 57 ms.

9. Write some C code which will enable the real time interrupt and set the real time interrupt rate to about 57 ms.

10. Write an assembly routine which will implement an upcounter on the four least significant bit of Port B while leaving the four most significant bits unchanged.

11. Write an C function which will implement an upcounter on the four least significant bit of Port B while leaving the four most significant bits unchanged.

12. Write an assembly routine which will implement an Johnson counter on the four most significant bits of Port B while leaving the four most significant bits unchanged.

13. Write an C function which will implement an Johnson counter on the four most significant bits of Port B while leaving the four most significant bits unchanged.