

EE 308 – Homework 4

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	AC	23	65	87	23	92	BA	E5	3A	12	90	42	22	50	91	23
1FE0	B2	A6	C1	25	90	F2	C2	69	99	01	B2	C2	76	23	22	54
1FF0	75	43	20	C4	21	D0	23	24	A5	29	BC	B1	21	70	32	61
2000	B5	2D	24	DC	82	A3	5B	9A	CA	3A	9F	2C	60	11	4C	4F

(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?

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 0xA23C. The next time the TCNT register is read, the value is 0x251A. 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	AC	23	65	87	23	92	BA	E5	3A	12	90	42	22	50	91	23
FFD0	B2	A6	C1	25	90	F2	C2	69	09	01	B2	C2	76	23	22	54
FFE0	75	43	20	C4	21	D0	23	24	A5	29	BC	B1	21	70	32	61
FFF0	25	2D	24	DC	82	A3	5B	9A	CA	3A	9F	2C	60	11	20	4F

(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	TCLT1	TCTL2	TCTL3	TCTL4	TFLG1	TFLG2
00	87	05	C2	A4	5F	76	15	00

(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 real time interrupt and set the real time interrupt rate to about 57 ms.