This print-out should have 12 questions. Multiple-choice questions may continue on the next column or page – find all choices before making your selection. The due time is Central time.

EE345L Valvano Homework 8.

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001 (part 1 of 1) 10 points

Assume you are interfacing a square-matrix keyboard. I.e., the size of the keyboard is 1-by-1, 2-by-2, 3-by-3, etc. If you are using a scanned approach, how many keys can you interface with 16 parallel I/O pins? For example, if you can interface a 3-by-3 keyboard, specify your answer as 9 keys.

Answer in units of keys.

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002 (part 1 of 1) 10 points

Assume you are interfacing a 19-by-7 matrix keyboard. If you are using a scanned approach, how many 8-bit I/O ports do you need to interface this keyboard? For example, if you need 10 I/O pins, then two ports will be required, and the answer should be 2.

Answer in units of ports.

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003 (part 1 of 1) 10 points

Assume you are interfacing a matrix keyboard using the multiplexed/demultiplexed approach. Each I/O port has 8 bidirectional pins. Given 2 I/O ports, what is the maximum number of keys that can be interfaced? For example, if you can interface an 8 by 8 matrix keyboard, then the answer should be 64.

Answer in units of keys.

---

004 (part 1 of 1) 10 points

Consider the following 4-by-4 scanned matrix keyboard.

0	1	2	3
4	5	6	7
8	9	*A*	*B*
C	*D*	*E*	*F*

In particular, what happens if the **5**, **7**, and **F** keys are simultaneously pressed?

1. The software will be able to properly detect these exact three keys are pressed.

2. It will appear to the software that these four keys are pressed, **5**, **7**, **D**, and **F**.

3. This situation will cause a hardware short circuit.

4. Because **7** and **F** are in the same column, the software will not be able to detect both these two keys.

5. Because **5** and **7** are in the same row, the software will not be able to detect both these two keys.

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005 (part 1 of 2) 10 points

Which interrupt number do you use when compiling an input capture 7 ISR using Metrowerks? In particular, what number goes into the **xx** spot in the following C code?

```
interrupt xx void handlerIC7(void){
  Count++;
  TFLG1 = yy;
}
```

---

006 (part 2 of 2) 10 points

What value goes in the **yy** position? Give your answer as a decimal number 0 to 255.

---

007 (part 1 of 1) 10 points

Consider the following code.

```
PORTT |= 0x01;
```

Assume this code was compiled with the Metrowerks compiler. Which statement is true?

1. This code is not reentrant because it is friendly.

2. This code is reentrant because it does not modify an global variables (I/O ports are considered local).

3. This software is not reentrant because of the read-modify-write operation.

4. This code is reentrant because it is friendly.

5. This code is reentrant because it is atomic.

---

008 (part 1 of 1) 10 points

Is the following function reentrant?

```
short calc(short x){
   short y;
   y=2*x;
   return y+5;
}
```

Choose the correct yes/no and justification.

1. No, because the function is not atomic.

2. Yes, because the function is atomic.

3. Yes, because the function is friendly.

4. No, because of the write-read sequence on variable **y**.

5. Yes, because all variables are allocated on the stack.

6. No, because overflow can occur.

---

009 (part 1 of 1) 10 points

Consider the following two input capture interrupt service routines. Each ISR will be invoked by the rising edge of their corresponding inputs.

```
void interrupt 8 IC0Han(void){
   TFLG1 = 0x01;
   Count0++;
}
void interrupt 9 IC1Han(void){
   TFLG1 = 0x02;
   Count1++;
}
```

What happens if both **PT0** and **PT1** rise simultaneously?

1. The two ISRs will be serviced one at a time. First, **IC0Han** will start, increments **Count0**, then finishes. Next, **IC1Han** will start, increments **Count1**, then finishes.

2. The two ISRs will be serviced, but one interrupts the other. First, **IC1Han** will start. Because **IC0Han** is higher priority, it will interrupt the lower priority program, increments **Count0**, then finishes. Then **IC1Han** is restarted, increments **Count1**, then finishes.

3. Only one will execute, the other will be lost. First, **IC0Han** will start, increments **Count0**, then finishes.

4. Both will run simultaneously.

5. Only one will execute, the other will be lost. First, **IC1Han** will start, increments **Count1**, then finishes.

6. The two ISRs will be serviced one at a time. First, **IC1Han** will start, increments **Count1**, then finishes. Next, **IC0Han** will start, increments **Count0**, then finishes.

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010 (part 1 of 1) 10 points

On both the 812A4 and the 9S12C32, the timer channel 1 flag, **C1F**, is bit 1 of the **TFLG1** register. Which explanation best describes the following code segment?

```
TFLG1 |= 0x02;
```

1. This software only sets the **C1F** bit high. It is friendly.

2. This software will clear all flag bits in the **TFLG1** register. It is not friendly.

3. This software only clears the **C1F** bit low. It is friendly.

4. This will cause a run-time error because the software can not set flag bits in the **TFLG1** register.

5. This will cause a compile error because the software can not set flag bits in the **TFLG1** register.

6. This software will set all flag bits in the **TFLG1** register. It is not friendly.

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011 (part 1 of 1) 10 points
Which software sets input capture channel 4 to occur on the falling edge of **PT4**?

1.
```
TCTL3 = (TCTL3&0xFC)|0x03;
```

2.
```
TCTL3 = (TCTL3&0xFC)|0x02;
```

3.
```
TCTL3 = (TCTL3&0xFC)|0x01;
```

4.
```
TCTL4 = (TCTL4&0xFC)|0x01;
```

5.
```
TCTL4 = (TCTL4&0xFC)|0x02;
```

6.
```
TCTL4 = (TCTL4&0xFC)|0x03;
```

---

012 (part 1 of 1) 10 points
Which software sets input capture channel 6 to occur on both edges of **PT6**?

1.
```
TCTL4 = (TCTL4&0xCF)|0x30;
```

2.
```
TCTL3 = (TCTL3&0xCF)|0x20;
```

3.
```
TCTL4 = (TCTL4&0xCF)|0x10;
```

4.
```
TCTL4 = (TCTL4&0xCF)|0x20;
```

5.
```
TCTL3 = (TCTL3&0xCF)|0x30;
```

6.
```
TCTL3 = (TCTL3&0xCF)|0x10;
```