EE 354
Final Exam Review 2   **November 28, 2018**
Final Exam is   Monday, December 10, 2018 at 11:00am

The following 10 examples or for the 8051
1. Show what is in the accumulator after each of the following sequences runs.

A) `mov r3, #42h`
   `mov r1, #3`
   `mov a, @r1`
   `add a, 3`
 	
A = _____
	B) `mov a, #56h`
	   `xrl a, #0AAh`
	   `anl a, #0EEh`
	   `orl a, #55h`
	
	A = _____
		C) `setb c`
		   `mov a, #88h`
		   `addc a, #99h`
		   `mov acc.3, c`
		   `rrc a`
		
		A = _____

2. Write an 8051 assembly language program to copy the data from port 3 to port 1 but with the nibbles reversed in order.

3. The following instruction has two operands and two addressing modes. List the operands and the corresponding addressing modes.
`mov a, @r0`

4. Write a loop which fills all of data memory (0 to 255) with zeros. Use 8051 assembly language.

5. The program below has an error that makes it get "lost" sometime after the call statement. What is the error?

```
cseg at 0h          sub1: setb
mov sp, #8          RS0
mov r1, #5          clr RS1
call sub1           pop 1
last:sjmp           mov P1, r1
last                      ret
```

6. Write a MACRO called XOut which will send register x to port 1 where x is any register R0 to R7.

7.Write two subprograms: The first is called SetP1 and sets the odd numbered bits of P1 to 1 and leaves the even numbered bits unchanged. It is in 8051 assembly language. The second is identical but uses the C language for the 8051.

Assembly language	C language

8. Show what is in registers R0 to R3, the accumulator, and internal memory locations 7 to 0C when the program below completes. Assume register bank 0. Use X for indeterminable.

```
mov sp, #8
mov r1, #1
mov r2, #2
mov r3, #10h
push 3
push 2
push 1
pop 2
pop 1
pop 1
push 3
pop 2
Last: sjmp Last
```

Registers

A	
R0	
R1	
R2	
R3	

Data memory

7	
8	
9	
0A	
0B	
0C	

9. Suppose I have two modules both written in C and both in the same project. Module A calls a function in module B and module B returns a value. To make this work we must use the `public` and `extern` declarations. Does `Public` go in module A and `extern` in module B or vice-versa?

10. In the program segment below a 16-bit integer value is assign to an 8-bit unsigned char. The Keil C compiler will allow this syntax. What is the value in the c variable when the program runs.
```
unsigned char c;
int i = 0x1234;
c = i;
```

*The following 10 examples are for the ARM Cortex M4*

1. The STM32F407VG has 14 timers that are classified as *Advanced Control Timers* (2), *General Purpose* (4 are either 16-bit or 32-bit timers and 6 are 16-bit timers), and *Basic Timers* (2). Which of these are used for the UART and PWM?

2. How does the link register work and how does it allow subprograms to run faster?

3. A push button has been connected to PB2 and an LED had been connected to PA9. Write a C program to turn the LED on as long as the push button is closed. Your program should run in a forever loop.

+5 volts

GPIO Pin
PB2 .

10K

+5 volts

GPIO Pin
PA9

1K
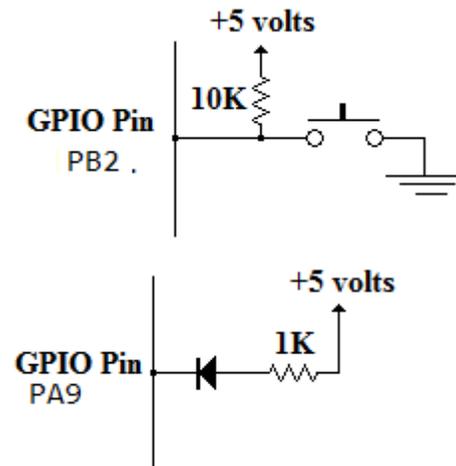
4. The program below is meant to be an embedded assembly routine titled *Mystery*. Answer the following questions.

| A) Write a few sentences explaining what the program does. | ```<br>__asm void Mystery(int i)<br>  {lsl r2, r0, #4;<br>LP sub r2, #1<br>   cmp r2, #0<br>   bne LP<br>   bx lr<br>   }<br>``` |
| --- | --- |

B) How is the parameter *i* used, if it is used at all?

C) Give an example of a C-Statement that could call this subprogram.

5.  Write a loop in C for the ARM M4 processor which toggles bit PA5 as fast as possible without changing any other bits on PA.  Assume PA5 has been set up for high speed output.

6.  Write a function for the ARM M4 processor in C which accepts two ints called *a* and *b*.  If *a* is greater than or equal to *b* return the sum of the two.  Otherwise return the difference of b – a.  Name your function MyFunction.

7.  The figure below shows a scope trace for a PWM signal which has an encoded sine wave.  The right most figure is a blow up of the left figure with an expanded time scale.
   A) What is the frequency of the sine wave?

   B) What is the base frequency of the PWM signal?
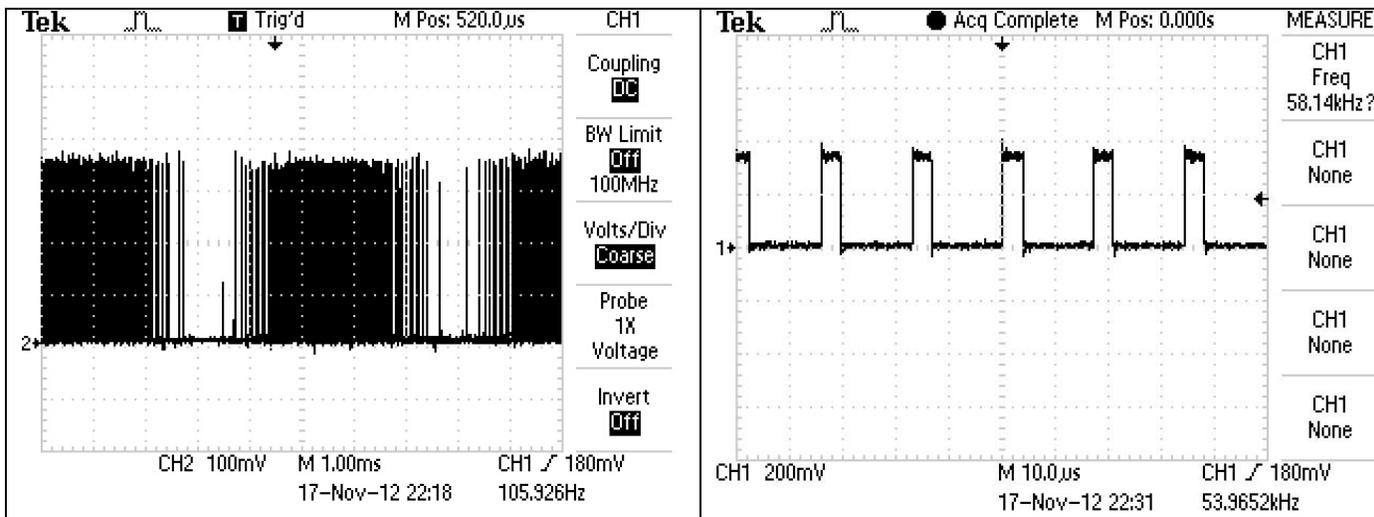


8. Let the two-bits at PA1 and PA2 represent a two bit number 00, 01, 10, or 11.  *Write a function* which inputs these two bits and returns an int with a value of 0, 1, 2, or 3 to reflect the value of the two bits.  Name your function *GetBits* and assume PA1 and PA2 have already been defined to be input.

9. Fill in the value that each variable below will have when the program completes.

i = 17

j = 8

R0 = 17

R1 = 8

R2 = 5

```
//Exam3Asm.c
__asm int Function1(int x, int y);
int main()
  {int i, j;
   i = 4;
   j = 8;
   i = Function1(i, j);
  }

__asm int Function1(int x, int y)
  { mov R2, #5;
    add R0, R1;
    add R0, R2;
    bx lr
  }
```

10. Calculate the correct values to put into the *Baud Rate Divisor* register for a baud rate of 9600 baud if the UART clock is set to 16 MHz.