EE 5314 Embedded Microcontroller System Design
Test 1 Example Questions

Due to similarity to test questions, no solutions will be provided for these questions.

1. How many instruction cycles does it take for the following code to execute?


```
            mov        #10, W0
loop:       dec        W0, W0
            bra        Z, end_here

            repeat     #100
            nop
            bra        loop
end_here:
```

2. If the processor clock rate is 32 MHz, what is the execution time for step 1 in microseconds?

3. Write a function, wait_52083ns, that waits 52.083µs as accurately as possible given a clock rate of 32 MHz.

4. Write initialization code to configure a 24FJ64GA002 in a 28p DIP package with 10 analog inputs, UART1 connected to pins RP0 and RP1, 5 digital inputs, and as many digital outputs as possible. Why is this a conflicting requirement and what might be a solution?

5. Write ASM functions that instantiate the functions declared below:

```
// returns x-y
extern signed int add(signed int x, signed int y);
// returns minimum value in the array x with count elements
extern unsigned int min(unsigned int x[], unsigned int count);
// returns the max of x and y
extern unsigned int max(unsigned int x, unsigned int y);
// returns x * y
extern unsigned long mul(unsigned int x, unsigned int y);
// returns x / y
extern unsigned int div(unsigned int x, unsigned int y);
// returns x / y
extern unsigned int div(unsigned long x, unsigned int y);
// returns x / y
extern signed int div(signed long x, signed int y);
// returns maximum value in the array x with count elements
extern unsigned int max(unsigned int x[], unsigned int count);
// returns minimum value in the array x with count elements
extern unsigned int min(unsigned int x[], unsigned int count);
```

6. Suppose you want to read a word stored in the LSW of a 32b program word. The word address (24bit value) is stored in W3:W2 prior to calling a function, readprogword. readprogword reads the LSW of a 32bit program word and stores the result in W0. Solve this using PSV and table pointer methods. Try this again returning the MSW at the address (what are the problems?).

7. Configure UART1 to operate at 9600baud with a clock rate of 10 MHz with no parity and 1 stop bit.

8. Write a short ASM routine that will set a green LED connected to RB.0 (anode to pin, cathode to ground through resistor) if the string "green" is received on UART1.

9. Explain the purpose of storage capacitors and bypass capacitors.

10. Suppose a ST7565R-based 128x64 character LCD display was connected to the SPI1 port of the controller. Modify the putc() function as follows: void gr_putc(char c, int underline). If underline = 1, then an underline should be added under the character being drawn.

11. Suppose a ST7565R-based 128x64 character LCD display was connected to the SPI1 port of the controller. Modify the putc() function as follows: void gr_putc(char c, int mode). The modes (clear, set, and invert) should be the same as those for gr_set_pixel().