



Indicate the size of each of the following registers and explain what each is used for:

Stack Pointer

Instruction Register

R13 Register

Z Register

Consider the following delay loop:

```
delay:
    ldi r16, val
loop:
    dec r16
    brne loop
```

(a) (3 points) What value should be used for `val` in order to cause the loop to execute the most number of times. For that value, how many times will the `dec` instruction be executed?

(b) (3 points) Using your answer to (a), how much time will the delay loop take to execute on your microcontroller board?

(c) (4 points) Modify the code given above so that it is a subroutine that can be called with: `call delay`.

Quiz 1



Name: _____

Suppose that the LCD is connected to PORTB. Indicate what each pin is connected to and explain the role of each pin.

(a) Suppose that the ADC subsystem has been configured as desired. What must be done to initiate an analog to digital conversion?

(b) What will happen when the analog to digital conversion is completed?

(c) What do the **MUX4:0** bits of the **ADMUX** port do?

(d) How many bits are used to store the result of the ADC?

(a) Which register(s) must be modified in order to enable the external interrupt you used in lab 6.

(b) Assume that a call to `delay1ms` takes exactly 16,000 instructions before returning. Write a subroutine `delay50ms` that uses `delay1ms` to create a delay of approximately 50 ms.

(c) How many cycles too few/many does your subroutine in the previous part differ from the exact delay?

Quiz 1



Name: _____

As best as you can, describe the various modes of operation available on the ATmega32's analog to digital subsystem.

Quiz 1



Name:

Describe as many differences as you can between the following waveform generation modes: CTC, Fast PWM, and Phase Correct PWM.

Suppose that the timer/counter1 subsystem is configured to perform an input capture whenever a rising edge is seen on the input capture pin. Suppose also that a subroutine called `storeCapture` is available. Complete the ISR below which will call `storeCapture` and then reset the timer/counter1's timer (set the counter to zero).