ME333 Introduction to Mechatronics Name ____Numair Ahmed_____ 2021
Quiz 6: IO, Counters/Timers, OC, Analog Input

1. Use the IO SFRs to make pin CN14 an input and enable the pullup resistor:
TRISCbits.TRISC14 = 1; //TRISC14 sets pin C14 to input
CNPUEbits.CNPUE14 = 1; //CN14 input has internal pull up resistor

2. List two differences between the CoreTimer and Timer2:
- Time2 is a peripheral timer rather than a part of the CPU and can be used for interrupt tasks more effectively than the core timer.
- Core timer can be used do things like keep actual time of a running code block

3. Timer1 has been setup to count external pulses, and can have a prescaler of N = 1, 8, 64, or 256. What is the largest number of input pulses that can be counted before the timer rolls over, and what prescaler N and period register PR1 are used to count to this number?
Can count all the way to 2^{16} - 1 which is [0:64999].
Use prescaler N = 1 so that each rising edge is counted.
Use PR1 =

4. OC4 and Timer2 are used to create 2000 Hz PWM with 20% duty cycle.
   a. Assuming you use a prescaler of N = 2 and a PBCLK of 80 MHz, what is the value of PR2?
   Say that PBCLK/PWM = CPU_cycles
   Then, CPU_cycles = N * (PR2 + 1)
   Then, PR2 = (CPU_cycles/N) - 1

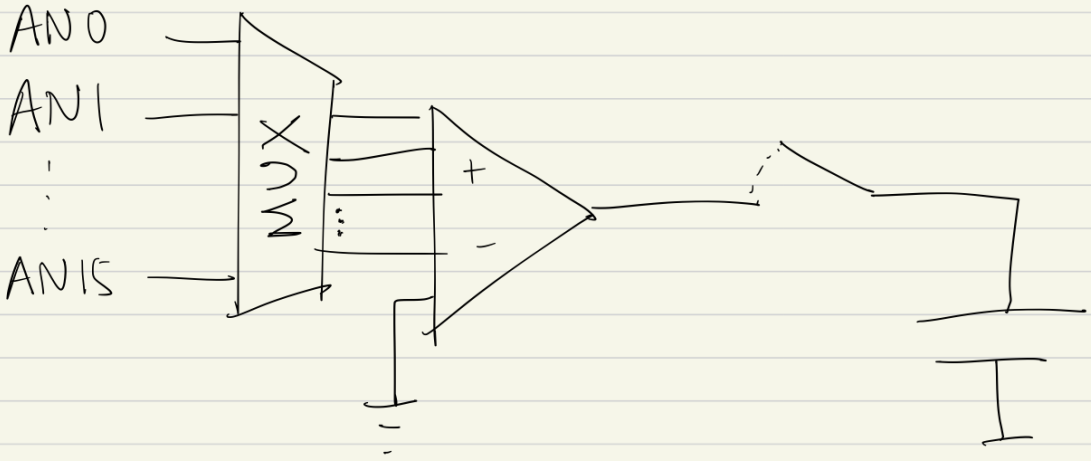
   Therefore,
   CPU_cycles = 80000000 / 2000 = 40000
   PR2 = (40000/2) - 1
   PR2 = 19999

   b. What is the value of OC4RS?
   Duty cycle = OC4RS /(PR2 +1)
   OC4RS = duty_cycle*(PR2+1)

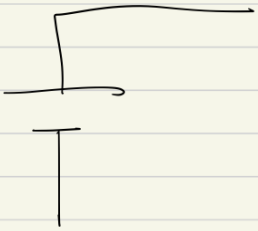
   OCR4S = 0.20*(19999 + 1) = 4000

5. Describe and draw a picture of the two steps in the process of reading an analog input.

Step 1: charge cap from voltage input



Step 2: Conversion Step



Compare charge in capacitor to voltage from DAC on PIC32.

In this step, the DAC voltage outputs a charge corresponding to a digital signal and compares that charge to the voltage of the cap. The PIC adjusts the digital input into the DAC until its output voltage matches the output voltage of the cap closely. This DAC digital input is then saved as the digital conversion for the cap's charge.